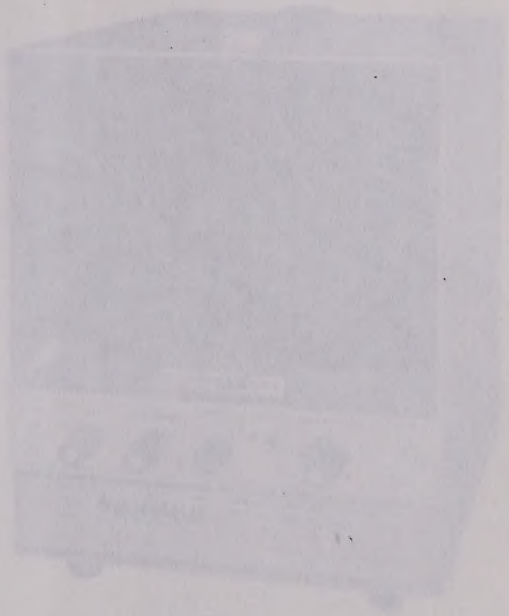
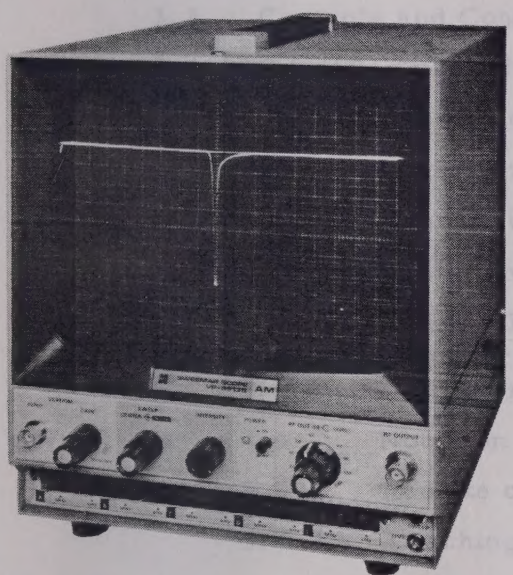
MANUAL PART NO.
MEP8913B-0



SWEEMAR SCOPE

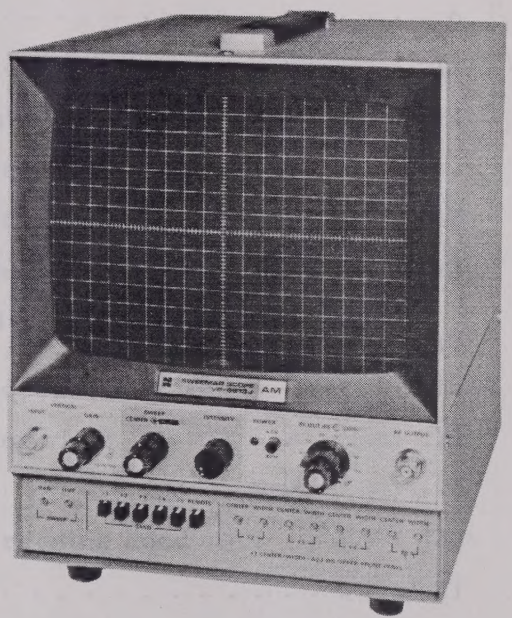
VP-8913B VP-8915B
VP-8913J VP-8915J

National



VP-8913B AM Band

VP-8915B VHF Band



VP-8913J AM Band

VP-8915J VHF Band

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BLOCK DIAGRAM

"B" series BLOCK DIAGRAM 24

"J" series BLOCK DIAGRAM 25

Section 1. PRECAUTIONS

AC power supply

The SWEEMAR SCOPE in this series is designed to operate on a 100 V, 115 V, 215 V, or a 230 V AC power supply depending on position of line voltage selector.

The voltage range indicated by the arrow of the line voltage selector plug located on the rear panel of the instrument is the proper operating voltage. Prior to use, make certain this indication matches the line voltage.

Protecting attenuator

An external voltage applied to the output connector may deteriorate the attenuator circuit of the instrument. Be particularly careful not to touch the tip of the output cable to any point of hot potential.

Section 2. GENERAL DESCRIPTION

2.1 General

The SWEEMAR SCOPE series has combined the features of a sweep signal generator with optionally presettable markers and a monitor scope in one instrument, making it a greatly versatile sweep system for radio production lines.

One of the shortcomings found in the previous sweep signal generators was the difficulty in alteration of the marker frequencies. This has been solved by employing the digitally synthesized variable marker circuit. The marker frequencies are set via digital switches located on the front panel ("B" series) or on the bottom ("J" series) with resolution of 1 kHz (AM band) or 10 kHz (VHF band). This allows the user to optionally make the desired marker frequency settings, while the accuracy and stability of the crystal resonator type marker is maintained.

Consequently, maintenance for marker frequency alteration is no longer required, effectively increasing the in-use time of the equipment. Also, the 9-inch, large screen monitor included in one cabinet has made a more compact unit available than conventional "GENESCOPES".

The number of cables required between this SWEEMAR SCOPE and the device under measurement is only two, one for supplying sweep output and the other for receiving detected signal input, making the reshuffle of the equipment due to changes in the production line more simple.

The "B" series (VP-8913B, VP-8915B) is one-band type and the "J" series (VP-8913J, VP-8915J) is five-band type.

The "J" series features the presettable five bands in each of which the sweep width, center frequency and the marker frequencies are predetermined and each band is selected with a front-panel push-button

switch. The band selection can also be remotely controlled.

Commonly for both series, other features include a sweep signal output of 100 mVrms, built-in 70 dB electronic attenuator which may also be remotely controlled, and the improved accuracy of the tracking adjustment by slowing down the sweep rate partially in the vicinity to the marker frequencies.

Such new functions make this series of sweep signal generator with monitor well suited for production of radios, filters, and other components.

2.2 Features

[1] Built-in digitally synthesized marker generator circuit.

- o Accurate and stable markers with crystal accuracy.
- o Presettable markers covering a wide range of frequency.
- o Each of five bands contains five markers. (J series)
- o Easily settable and readable marker frequencies.

[2] Ideas to improve the accuracy of tracking adjustment.

- o Variable sweep repetition rate.
  (Line frequency x 1/2, 1/3, 1/4, 1/5, or more)
- o Partially magnification of the trace by slowing down the sweep rate in the vicinity to the tracking markers.

[3] Series arrangement for entire radio frequency bands.

- o VP-8913B, VP-8913J AM band, 100 kHz - 30 MHz
- o VP-8915B, VP-8915J VHF band, 10 MHz - 225 MHz

[4] Pre setting of the sweep width, center frequency, and the marker frequencies for each of five bands. (J series)

- o Easy selection of the desired band with a push-botton switch.
- o Remote control function.

[5] Compact sweep and monitor system in one instrument.

2.3 Specifications

	VP-8913B	VP-8913J	VP-8915B	VP-8915J
Sweep frequency				
Frequency range	0.1 - 30 MHz		10 - 225 MHz	
Center frequency range	0.1 - 30 MHz		12.5 - 222.5 MHz	
Sweep width	0.1 - 20 MHz		5 - 215 MHz	
Band Selector	——	Push switch	——	Push switch
Sweep output				
Output level	100 dB(0.1Vrms) ±1 dB into 50Ω load			
Output impedance	50Ω			
Attenuator	10dBx7, Continuously variable between steps and to 80dB			
Marker				
Frequency	Any frequency within the sweep range			
Setting type	Five 5- digit switches			
Minimum interval	1 kHz		10 kHz	
Frequency accuracy	±0.05% + 1 kHz		±0.05%	
Number of markers	5 points, simultaneous			
Number of bands	1 band	5 bands	1 band	5 bands
Marker type	Intensity modulated markers			
Remote control	—	Possible	—	Possible
Monitor				
Sweep repetition rate	LINE FREQ. x 1/2, 1/3, 1/4, 1/5 or			
Sweep waveform	more Sawtooth wave			
Duty cycle	Approx. 1:9 (at LINE FREQ. x 1/2)			
Vartical-axis sensitivity	10mV/DIV. with variable control			
Vartical-axis frequency range	DC-5kHz (5 DIV)			
Vartical-axis input impedance	Approx. 500kΩ			
Horizontal-axis amplitude	17 DIV or more (fixed)			
CRT type	9-inch, 90° electromagnetic deflection			
Power Requirements	AC 100, 115, 215, 230V±10%, 50/60 Hz approx. 40VA power consumption			
Dimensions & Weight				
Height	251mm	271mm	251mm	271mm
Width	233 mm			
Depth	300 mm			
Weight	Approx. 8kg	Approx. 8.5kg	Approx. 8kg	Approx. 8.5kg
Accessories	Hood (1) Spare fuse (1) Instruction manual (1) RF cable (Black) (1) AF cable (Red) (1)			

Section 3. OPERATING INSTRUCTIONS

3.1 Installation

Prior to installing the SWEEMAR SCOPE on the workbench, the following items should be noted.

A location should be selected where reflections from the lighting in the area will not make the CRT display hard to watch. The accessory hood may be used to reduce glares of the screen. (Refer to Section 3., Item 3.4.9) The stand attached to the bottom plate (for "B" series only) may also be used to make the CRT easier to see.

3.2 Checking the power supply

Prior to performing the operational check, make certain the AC power supply voltage to the workbench is matched with the main power supply setting of the unit and that the rating of the fuse is correct.

3.2.1 Setting main power supply voltage

The Sweemar Scope series is designed to be operated with power supply voltages of 100V, 115V, 215V, or 230V by changing the connection of line voltage selector located on the rear panel. The voltage the unit has been set at is indicated by the arrow located in the LINE VOLTAGE indicator plate on the rear panel. If it does not suit for the line voltage to be used, it should be set according to the following procedures.

1. Remove the LINE VOLTAGE indicator plate from the rear panel of the unit.
2. Pull out the plug with the arrow on it, turn it to the correct voltage indication and re-insert it.
3. Make certain the LINE VOLTAGE plate is tightly secured before using the unit.

3.2.2 Main power supply fuse rating

A fuse is installed into the fuse holder fixed to the rear panel, to which the main power supply cord is connected..

When changing the voltage of the main power supply, or operating the equipment for the first time, always make certain the power supply voltage and the fuse rating are correct.

Main power supply voltage	Fuse rating
100 - 115V	1 ampere
215 - 230V	0.5 amperes

3.3 Controls and Connectors

The diagrams of outside view are included in the folding pages located at the back of this manual. The numbers used in the following explanation correspond to the numbers of the controls and connectors in the diagrams and should be referred to while the nomenclature and operating procedure is explained in this section.

Front panel

(1) RF OUTPUT ..... Sweep signal output connector. An output voltage of 100mVrms (50Ω load termination) may be obtained with all models of the series.

(2) RF OUTPUT dB ..... (Outer knob) 10 dB step attenuator. Turning this control counterclockwise provides 70dB of attenuation.
In case of "J" series, remote control of attenuation is available with an optionally provided remote control box, which is connected to the REMOTE connector (24) on the rear panel.

(3) LEVEL ..... (Inner knob) 10dB continuously variable attenuator. Turning the control clockwise reduces the attenuation, thus increases the output level.

In case of "J" series, the control may also be remotely controlled.

④ SWEEP
- CENTER (Outer knob) ..... This control adjusts the center frequency of the sweep signal oscillation. Turning the control clockwise increases the frequency.
- ⑤ WIDTH (Inner knob) ..... This control is used to adjust the sweep frequency range of the sweep signal oscillation. Turning the control clockwise makes the sweep width wider and the space between the markers more narrow.

In case of "J" series, these two controls are used solely for band F1 as the preset controls of sweep center frequency and sweep width respectively.

⑥ INTENSITY ..... This control adjusts the intensity of the brightness on the monitor. Turning the control clockwise increases the intensity.

⑦ SWEEP TIME .... A screw-driver adjustment for setting the sweep repetition rate. The normal repetition rate (1/2 the power line frequency) is obtained at its fully clockwise position.

Counterclockwise rotation of the adjustment will decrease the repetition rate up to at least 1/5 the line frequency.

⑧ SWEEP MAG .... A screw-driver adjustment to vary the partial sweep speed, consequently the horizontal magnification factor on monitor screen partially at the portion

of each marker.

The maximum magnification (the slowest sweep speed - 1 msec for each portion) is obtained at its fully clockwise position.

⑨ (Power pilot) .... This lamp lights when the power is ON

⑩ POWER ..... When the power switch is in the ▬▪ position, the power is ON, in the ▪▬ position, the power is OFF. The power is OFF when the shaft is protruded.

VERTICAL

⑪ GAIN ..... This is the gain control for the vertial axis. Turning the control all the way to clockwise brings it to a calibrated sensitivity of 10mV/DIV. Counter-clockwise (CCW) rotation lessens the sensitivity, and if turned completely CCW, over 40dB of attenuation is obtained.

⑫ ..... This is the vertical position control for the monitor. Turning the control clock-wise moves the trace toward the top of the screen.

⑬ V. INPUT ..... This is the input terminal to the vertical axis of the monitor. Because of its high input impedance, approximately 500 kΩ, it affects the device being measured very little.

⑭ (Digital switches).. These switches are used for setting the marker frequencies in the synthesized marker circuit. The details and operating procedure may be described in item 3.4 of this manual.

They are located on the front panel in "B" series, and on the bottom in "J" series.

⑮ ┌CENTER
F2
└WIDTH

These two controls respectively adjust the center frequency of the sweep signal oscillation and sweep width for band F2. Adjust these two controls as the same operating procedure described in items SWEEP ④ CENTER, ⑤ WIDTH.

⑯ ┌CENTER
F3
└WIDTH

Same as above, For band F3.

⑰ ┌CENTER
F4
└WIDTH

Same as above. For band F4.

⑱ ┌CENTER
F5
└WIDTH

Same as above. For band F5.

⑲ BAND
- F1
- F2
- F3
- F4
- F5
- REMOTE

Band selector and remote operation switch. Pushing on the button of F3, for example, you can obtain the sweep width, center frequency and the marker frequency which have been preset for band F3, and the controls and digital switches for other bands will be inoperative.

REMOTE position of this switch allows the remote operation of band selection and output level control by means of a remote control box.

Rear panel

⑳	(Power cord)	This is the mains power cord and is fitted with a 3-prong plug.
㉑	FUSE	This is the primary-side fuse. The rating of the fuse used should be in accordance with the mains power voltage.
㉒	(Ground terminal)..	The protection earth terminal provided on the cabinet should always be connected to ground for safety.
㉓	LINE VOLTAGE .. selector	This plug and socket type device is used to convert the voltage of power transformer primary winding of the unit to make it operate from a deferent voltage. The plate is fixed on by two screws, and the voltage indicated by the arrow is the voltage the unit is presently set to operate at.
㉔	REMOTE	Provided on only "J" series. A connector to be used for the remote function.

3.4 Operating procedure

3.4.1 General operations

(1) Prior to turning on the power switch, set all the controls to the positions indicated below.

	Controls	Position
Front panel	RF OUTPUT dB	100 dB
	LEVEL	CAL
	SWEEP CENTER	Center
	SWEEP WIDTH	Fully clockwise (CW)
	INTENSITY	Fully counterclockwise (CCW)
	GAIN	Anywhere
	⊣	Center
Rear panel	LINE VOLTAGE	Set to line voltage

(2) Press the POWER ON/OFF switch.

(3) Watching the CRT screen, adjust the INTENSITY to a level easy to see. Since the horizontal axis is connected internally in the unit, no horizontal position or horizontal gain adjustments will be necessary. The vertical position is adjusted by turning the control with a ⊣ mark on it. Set it to the proper position.

3.4.2 Setting marker frequency

(1) The digital switches are divided into five divisions by every 5 digits with each division being indicated with the letters A, B, C, D, and E from the left respectively, and the frequency units are noted with the marks ▲ MHz or ▲ kHz.

(2) When setting the marker frequency, always start with the lowest value in the A division, assigning the lowest marker frequency in this division. Then working toward the right, gradually set the frequency to a higher setting.

(3) Since the digital switch has no locking mechanism, it may be set on any value from 0 to 9, however, it should be set within the sweep frequency range for each of the A, B, C, D, or E divisions. When set outside this range, the marker will fail to appear or it could result in an error in the operations. When this happens, returning the digital switch back to a value within the sweep frequency range will restore normal operations.

(4) In case of "J" series, be careful of the relation between the band selection switch and the digital switches. When pushing on the button of BAND F1, only the digital switches of F1 would work normally.

3.4.3 Precautions in setting marker frequency.

(1) Some of the errors that may occur due to a faulty frequency setting are:

(a) The digital switch being set to a value lower than the sweep frequency range will result in the marker being at the left edge of the trace. A correct value will not be indicated in this case.

(b) The digital switch being set to a value higher than the sweep frequency range will result in the marker disappearing off the right hand side of the screen.

(c) If the digital switches in both A and B divisons are set to the same value, the two markers will not overlap, but appear apart with a fixed space between them.

When the A division digital switch is gradually set higher, the B marker will move to the right as if it were being pushed. Naturally this will result in an error.

(2) When the markers have a fixed space between them, the digital switch of the lowest frequency marker must be set to the far left position and digital switches of higher frequencies must be set toward the right as noted in 3.4.2 (2) above in order to restore normal operations.

(3) The marker to marker space cannot be set smaller than a certain value due to circuit design. This smallest marker to marker space is also relative to the sweep frequency range, and is obtained as a value of (sweep signal frequency range)/40.

(4) If sweep width of RF signal is more than five times the lowest set marker frequency, markers may flicker. In this case operation can be restored to normal by making the sweep width narrower with the SWEEP WIDTH control.

3.4.4 Setting sweep signal frequency range

(1) Starting from the left side A of the digital switch and working toward the right, increase the setting values in order of A, B, C, D, and E.

(2) When these 5 point markers are all set and displayed on the screen, adjust the SWEEP CENTER and the WIDTH controls located on the front panel.

(3) In case of "J" series, the setting of sweep signal frequency range for each of five bands shall be done individually.

The SWEEP CENTER and the WIDTH controls for Band F1 are located on the front panel, and the controls

for Band F2 to F5 are on the bottom.

(4) This completes the setting of the sweep signal frequency.

3.4.5 SWEEP TIME and SWEEP MAG Operating Procedure

a. SWEEP TIME

(1) When the sweep signal generator is used for tracking or covering adjustment, or filter characteristic measurement, high repetition frequencies (short sweep time) may cause measured waveforms to appear somewhat higher, thus impeding accurate measurement. To solve this problem, reduce the sweep signal frequency variation per unit time by narrowing the sweep width or by prolonging the sweep time during which the sweep signal generator is driven.

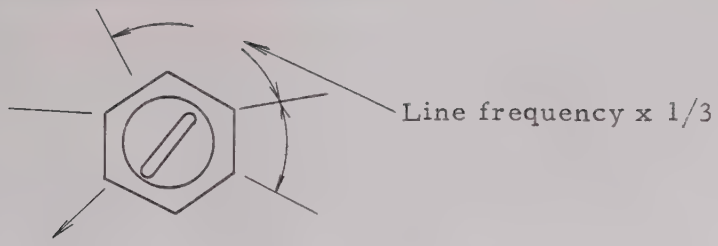
(2) The SWEEP TIME control varies the sweep repetition frequency (sweep time) as follows:

Rotated fully clockwise(↻) . . . Line frequency x 1/2

Rotated fully counterclockwise(↺) . . .
Line frequency x 1/5 or less

(3) The repetition frequency should be determined to be as high as possible, but within the range in which no error occurs, depending on the measured waveform. Too low a repetition frequency causes the display to flicker the display, which may cause the operator's eyes some discomfort.

(4) The SWEEP TIME control should be set between switching points; otherwise the repetition frequency may vary because of various fluctuations.



b. SWEEP MAG

(1) In measurement of high-Q (steep characteristic curve) devices such as filters or tuners, increasing the sweep time with the other conditions unchanged may cause an error in the amplitude of the peak value of the characteristic curve.

(2) This control permits a sweep signal frequency variation per unit time to be changed by varying the sweep generation drive signal near the marker. When the control is turned fully clockwise, it minimizes the frequency variation, thereby permitting accurate tracking point adjustment.

(3) If the SWEEP MAG control permits an accurate peak value measurement with no other controls used, the sweep time can be short (no display flickering occurs).

Generally these controls should be set as follows:

SWEEP TIME ..... Fully clockwise(↻)

SWEEP MAG ..... Fully clockwise(↻)

But they may be set at another position for efficient and accurate measurements, depending on the purpose for which the instrument is used.

3.4.6 Measurement procedure

(1) The output voltage should be taken from the RF OUTPUT connector through either a loop antenna or RF cable attached as an accessory, and then applied to the device to be measured. The output voltage of the units in this series is 100mVrms when terminated by 50Ω load.

(2) The signal from the device being measured is passed through a detector, then applied to the V INPUT connector of the SWEEMAR SCOPE.

(3) The attenuator value should be adjusted appropriately so that the device being measured does not receive excessive input. Also, V, GAIN and the vertical positioning control of the monitor section should be set for the trace on the screen to be watched easily.

(4) Tracking adjustments may be made by changing the tuned frequency of the device being measured.

3.4.7 Notes on measuring

General

When using a sweep signal generator to make tracking adjustments, the amplitude of the characteristic curve on the screen will appear lower than it actually is. This amplitude drop would be compared with the measurement value obtained by using a standard signal generator by using the equation below.

$$a = \left[1 + 0.195 \left(\frac{F}{TB^2} \right)^2 \right]^{\frac{1}{4}}$$

a : level drop ratio

F : Sweep frequency width (Hz)

T : Sweep rate (sec)

B : 3 dB bandwidth(Hz) of the device being measured.

The apparent bandwidth is calculated by the following equation.

$$\beta = \frac{B}{a^2}$$

(a : The level drop ratio obtained from the above equation.
B : 3 dB bandwidth (Hz) of the device being measured.)

To make accurate measurements, it would be better to have slower sweep speed and narrower sweep width. Hoever, in an actual measurement, there is a limit due to flicker of the trace and increase in measurement time.

For the ideal tracking adjustment in a radio receiver;

(1) Rotate dial of the radio receiver under test to tune it to a desired frequency.

(2) With the radio receiver left in the same state, apply the RF OUTPUT signal and observe the characteristic curve. Position the characteristic curve in the center of the screen by making sweep sidth narrow.

(3) The characteristic curve should appear on the screen as shown in the Fig. 3-4-1 below. Now changing the setting value of the digital marker switch, bring the marker to the highest point of the characteristic curve.

(4) Then restore the sweep width to normal by adjusting SWEEP WIDTH control.

(5) Sometimes marker may be seen shifted from top of the characteristic curve as shown in Fig. 3-4-2.

(6) In this case, move the marker to the top by resetting the digital marker switch as shown Fig. 3-4-3.

(7) This state faithfully represents the tracking marker, by this sweep generator, taking every factor like sweep time, bandwidth, delay etc. into consideration.

Fig. 3-4-1

Fig. 3-4-2

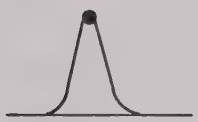


Fig. 3-4-3

3.4.8 Remote control

(1) "J" series provides the remote control function.

The items which can be controlled are as follows.

a) Band selection (F1 to F5)

b) RF Output (Attenuation, 70dB in 10dB steps)

c) RF Level (Continuously variable control)

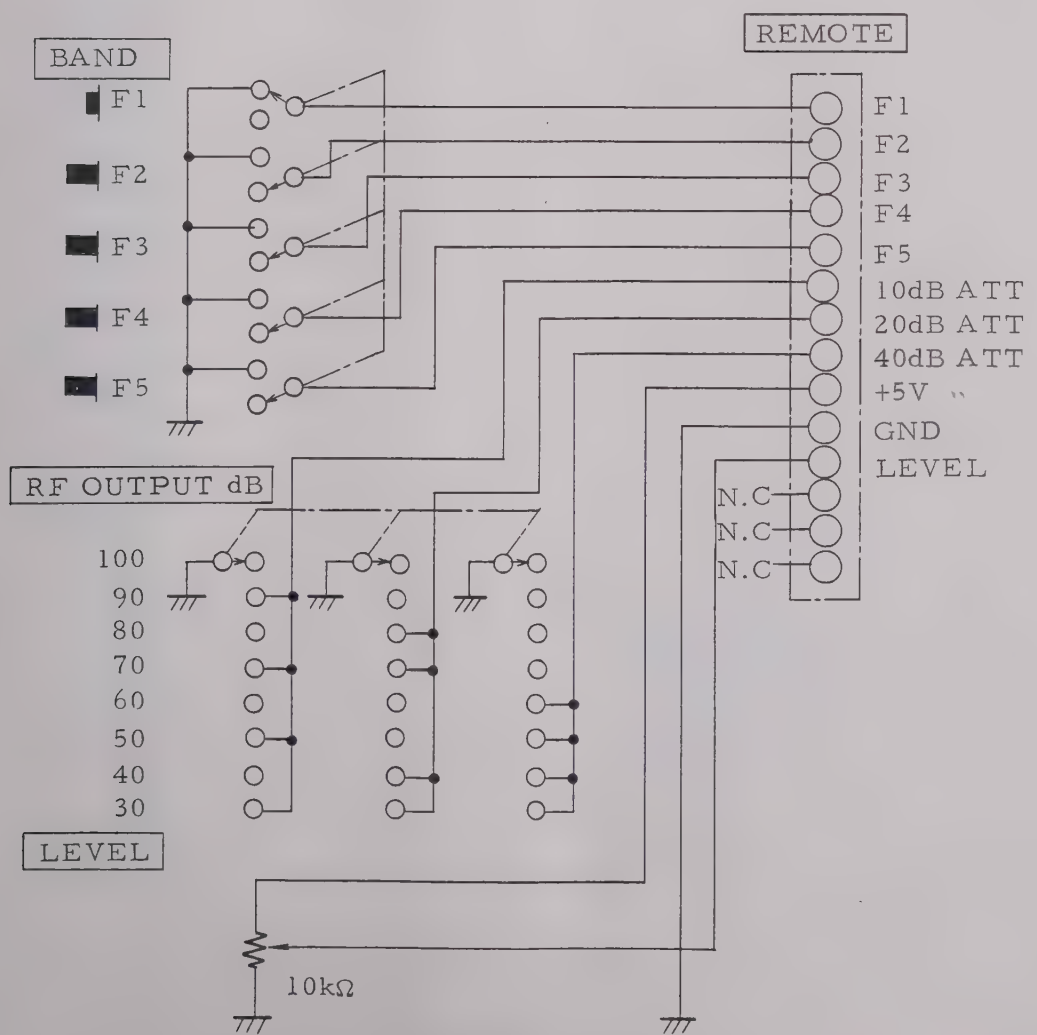
(2) External connection required for remote control is shown below. The REMOTE connector is located on the rear panel of the instrument.

(3) Push on the REMOTE button on the front panel.

The front panel BAND selector, RF OUTPUT attenuator and LEVEL control are made ineffective in this mode of operation.

NOTE: The mating plug for the REMOTE connector is:

AMPHENOL 57-30140



3.4.9 Attaching light screening hood

The light screening hood is included as an accesory, and may be mounted on the unit to block unwanted light and make the screen easier to see. It is attached by the procedures listed below.

(1) Loosen 3 of the outer cabinet fastening screws from around the front panel. (1 on the top, and 1 on each side.)

(2) Match the hood to the 3 screws and push it back as far as it will go. Tighten the screws.

Section 4. MAINTENANCE

4.1 Adjusting inclination of trace

The horizontal trace may appear inclined on the screen due to the effects of earth magnetism etc. This will vary depending on the particular location the unit is used. However, when the horizontal trace is not parallel to the horizontal graticule, it must be adjusted using the following procedure.

(1) Remove the two screws from the top of the cabinet.

> NOTE: DANGER
>
> The high-voltage CRT accelerator circuit is located inside this portion of the cabinet. Be particularly careful not to make contact with it.

(2) Loosen the hook-screw holding the deflection-yoke on the neck of the CRT. While observing the screen, bring the horizontal trace parallel to the horizontal graticule by rotating the deflection yoke in extremely small increments.

(3) When it is accurately matched, tighten up the hook-screw holding the deflection yoke. When doing this, tighten up the hook-screw while pushing the yoke gently toward the screen side to prevent it from slipping off onto the socket of the tube.

4.2 Cleaning graticule plate

When the graticule plate becomes dirty, brightness of the tube is sharply reduced and the display becomes hard to see. It should be cleaned periodically.

(1) Removal

The graticule plate is held in at the four points indicated by

the arrows in Fig. 4.2.1. The plate is removed by pressing in and rotating it either right or left.

(2) Cleaning

The front and rear of the graticule plate, and the screen of the CRT should be cleaned using a clean, dry cloth. Do not use alcohol, tetrachlorides, acetone, or other organic solvents.

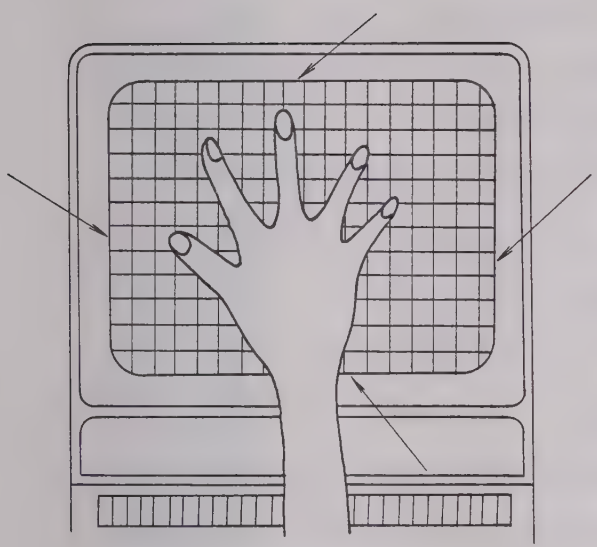


Fig. 4.2.1

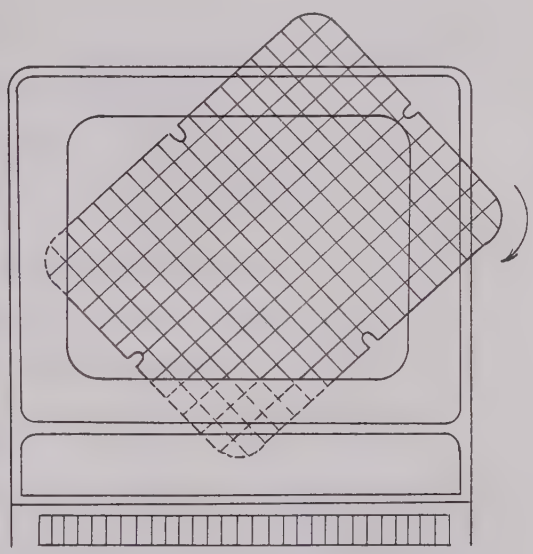


Fig. 4.2.2

(3) Installation

The corners of the plate should be slipped between the frame and the screen as shown in Fig. 4.2.2, and then rotated slowly in the direction of the arrow. The indentations cut into each edge of the plate will fit into projections behind the panel. When the plate is correctly installed, there should be very little movement in the plate. Check and make sure that the graticule plate fits in the frame.

4.3 Maintenance precautions

This section covers the procurement of parts, special precautions in replacing parts, and service.

4.3.1 Procurement of spare parts

The electrical components and the mechanical parts for the units of this series may be obtained from the dealer from whom this instrument is obtained.

4.3.2 Special precautions in replacing parts

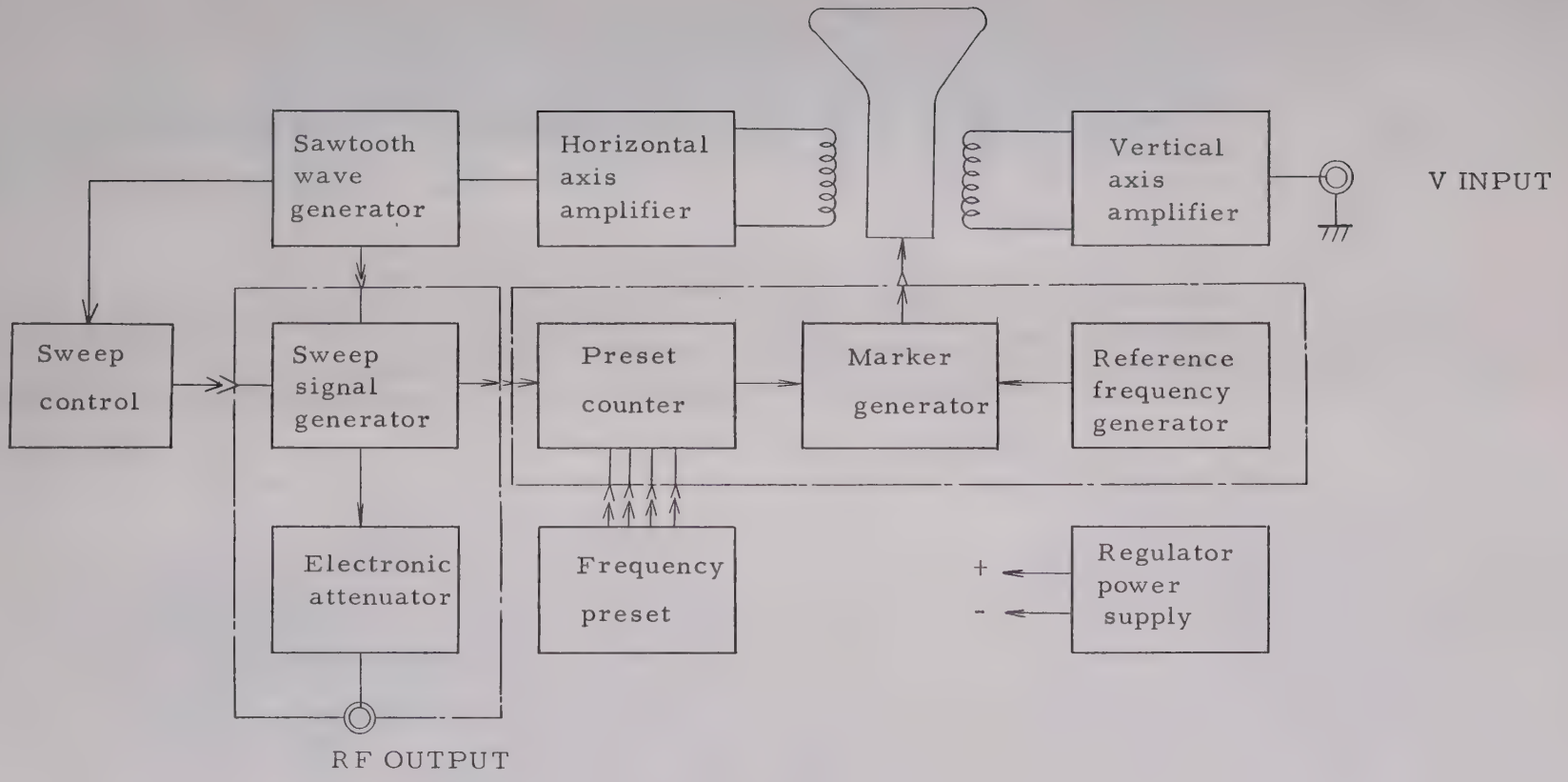
As a rule, the manufacturer recommends that the unit be shipped to one of its service centers qualified to make repairs on the unit when it is in need of service. The owner choosing to replace parts himself should note the following items.

(1) The hfe designation rank of the transistors.
(2) The working voltage of the electrolytic capacitors.
(3) The wattage rating of the fixed resistors.

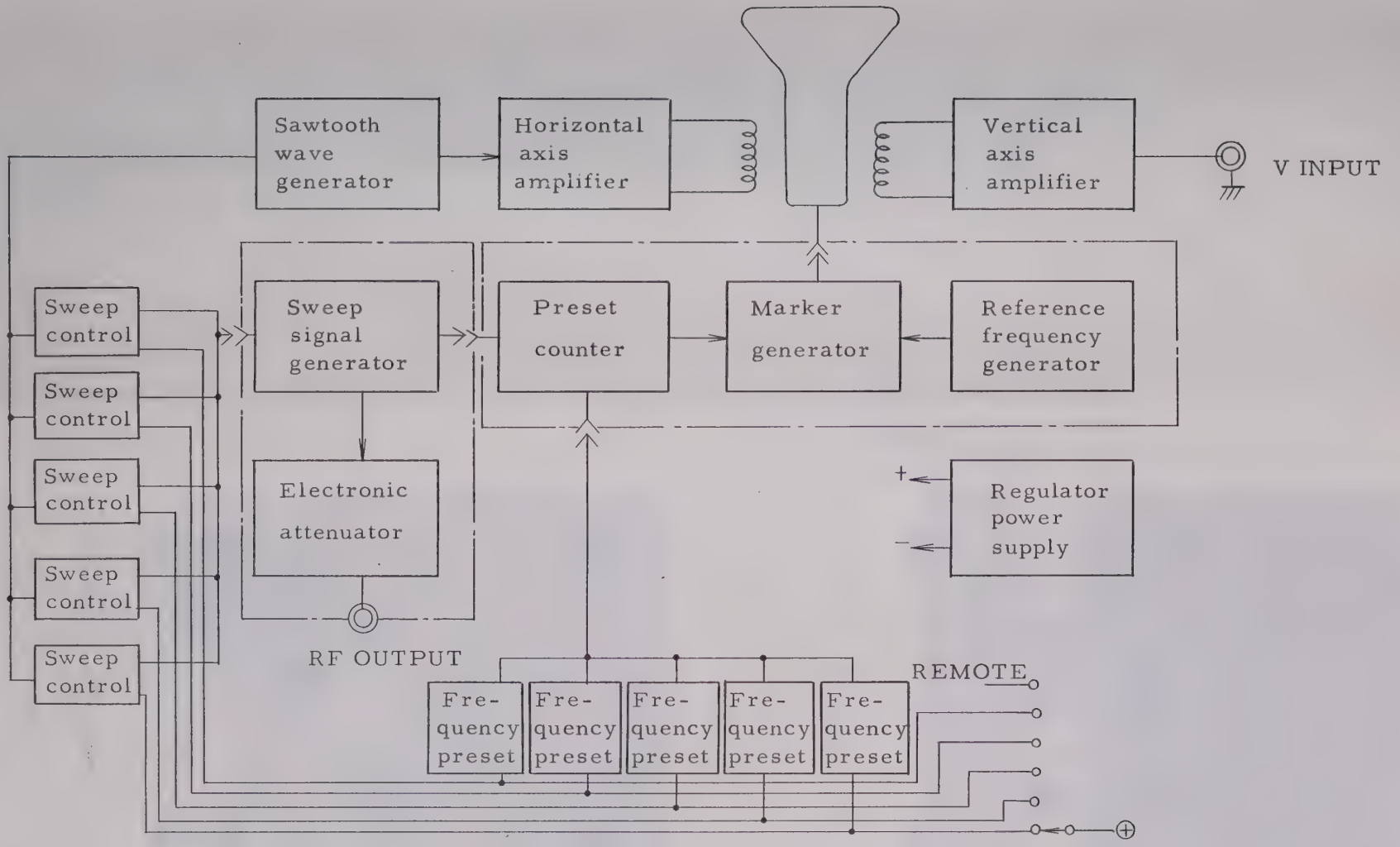
4.3.3 Communications with service center

When it becomes necessary to write to or otherwise contact one of the service centers concerning your unit, the following data should be included.

- Model (VP-8915B etc.)
- Serial number of the set (Label on rear panel)
- Symptoms

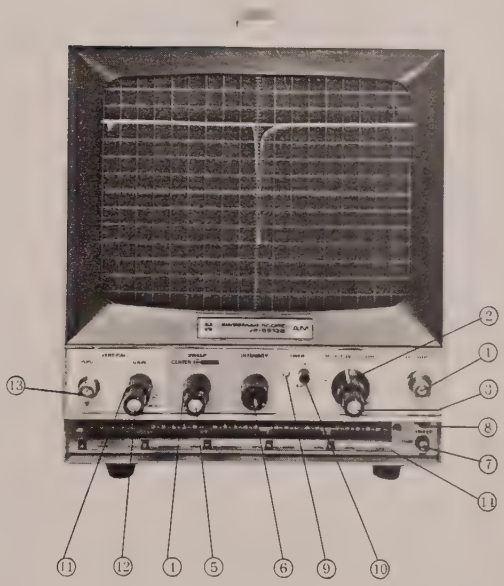


"B" series BLOCK DIAGRAM

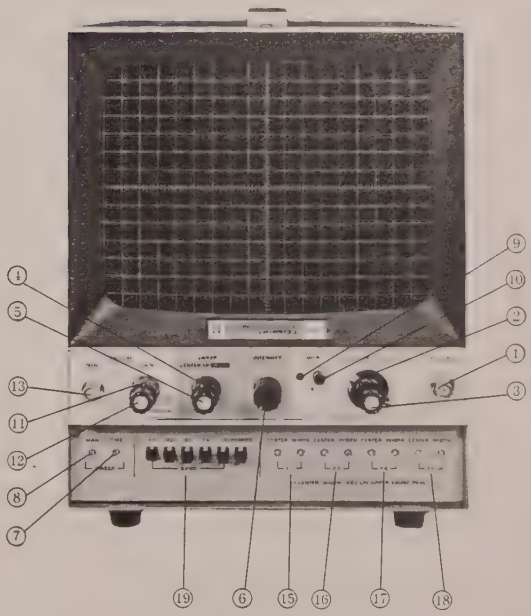


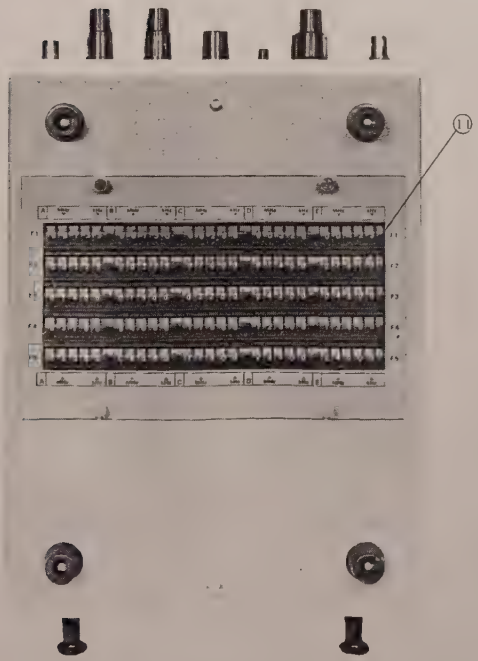
"J" series BLOCK DIAGRAM

B Series Front

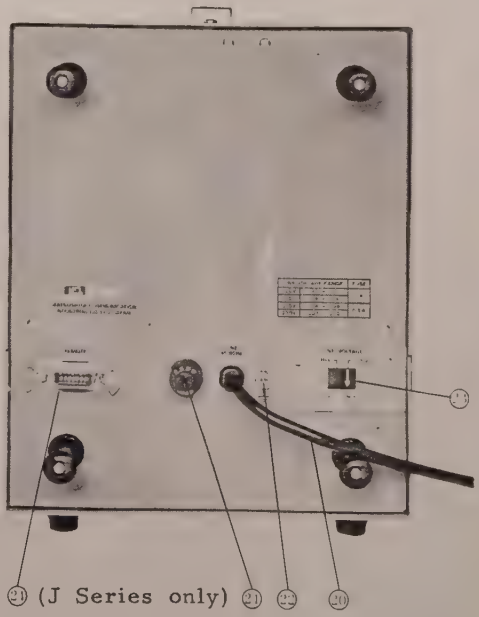


J Series Front





J Series Lower



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MKR-1-C DWG NO 4G203365

REF NO	QTY	PART NO	DESCRIPTION	
C 1	1	ECKW1H102KB5	C:FXD CER HI-K	1000PF +-10% 50V
C 2	1	ECKW1H102KB5	C:FXD CER HI-K	1000PF +-10% 50V
C 3	1	ECKW1H103ZF5	C:FXD CER HI-K	10000PF +80-20% 50V
C 4	1	ECKW1H103ZF5	C:FXD CER HI-K	10000PF +80-20% 50V
C 5	1	ECKW1H103ZF5	C:FXD CER HI-K	10000PF +80-20% 50V
C 6	1	ECKW1H103ZF5	C:FXD CER HI-K	10000PF +80-20% 50V
C 7	1	ECKW1H103ZF5	C:FXD CER HI-K	10000PF +80-20% 50V
C 8	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 14	1	ECQM1H104KZ	C:FXD FLM	0.1UF 10% 50V
C 16	1	ECQM1H473KZ	C:FXD FLM	0.047UF 10% 50V
C 17	1	ECQM1H104KZ	C:FXD FLM	0.1UF 10% 50V
C 18	1	ECKW1H102KB5	C:FXD CER HI-K	1000PF +-10% 50V
C 19	1	ECKW1H102KB5	C:FXD CER HI-K	1000PF +-10% 50V
C 20	1	ECKW1H102KB5	C:FXD CER HI-K	1000PF +-10% 50V
C 21	1	ECEA1AS101	C:FXD AL ELECT	100UF +-20% 10V
C 22	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 23	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 24	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 25	1	ECEA1CS101	C:FXD AL ELECT	100UF +-20% 16V
C 26	1	ECEA1CS101	C:FXD AL ELECT	100UF +-20% 16V
C 27	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 28	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 29	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 30	1	ECEA1AS101	C:FXD AL ELECT	100UF +-20% 10V
C 31	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 32	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 48	1	ECKW1H102KB5	C:FXD CER HI-K	1000PF +-10% 50V
CR 1	1	MA150TA	DIODE:SI	100MA 35V
CR 2	1	MA150TA	DIODE:SI	100MA 35V
CR 3	1	MA150TA	DIODE:SI	100MA 35V
CR 4	1	MA150TA	DIODE:SI	100MA 35V
CR 5	1	MA150TA	DIODE:SI	100MA 35V
CR 6	1	MA150TA	DIODE:SI	100MA 35V
CR 7	1	MA150TA	DIODE:SI	100MA 35V
CR 8	1	MA150TA	DIODE:SI	100MA 35V
CR 9	1	MA150TA	DIODE:SI	100MA 35V
CR 10	1	MA150TA	DIODE:SI	100MA 35V
CR 16	1	MA150TA	DIODE:SI	100MA 35V
CR 19	1	MA150TA	DIODE:SI	100MA 35V
E 1	1	3G400945	P8915A PC BOARD A11	MARKER (1)
J 1	1	M3110S40	CONNECTOR:PIN	10P
J 2	1	M3115S40	CONNECTOR:PIN	15P

MKR-1-C DWG NO 4G203365

REF	NO	QTY	PART NO	DESCRIPTION	
Q	1	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	2	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	3	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	4	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	5	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	6	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	7	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
R	6	1	ERD25TJ123V	R:FXD CARBON	12K OHM 5% 1/4W
R	7	1	ERD25TJ123V	R:FXD CARBON	12K OHM 5% 1/4W
R	8	1	ERD25TJ123V	R:FXD CARBON	12K OHM 5% 1/4W
R	9	1	ERD25TJ123V	R:FXD CARBON	12K OHM 5% 1/4W
R	10	1	ERD25TJ123V	R:FXD CARBON	12K OHM 5% 1/4W
R	11	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R	12	1	ERD25TJ332V	R:FXD CARBON	3.3K OHM 5% 1/4W
R	13	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R	14	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R	15	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R	16	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R	17	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R	18	1	ERD25TJ243V	R:FXD CARBON	24K OHM 5% 1/4W
R	19	1	ERD25TJ243V	R:FXD CARBON	24K OHM 5% 1/4W
R	20	1	ERD25TJ243V	R:FXD CARBON	24K OHM 5% 1/4W
R	21	1	ERD25TJ243V	R:FXD CARBON	24K OHM 5% 1/4W
R	22	1	ERD25TJ243V	R:FXD CARBON	24K OHM 5% 1/4W
R	23	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R	24	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R	25	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R	26	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R	27	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R	28	1	ERD25TJ822V	R:FXD CARBON	8.2K OHM 5% 1/4W
R	29	1	ERD25TJ153V	R:FXD CARBON	15K OHM 5% 1/4W
R	30	1	ERD25TJ223V	R:FXD CARBON	22K OHM 5% 1/4W
R	31	1	ERD25TJ333V	R:FXD CARBON	33K OHM 5% 1/4W
R	32	1	ERD25TJ393V	R:FXD CARBON	39K OHM 5% 1/4W
R	36	1	ERD25TJ472V	R:FXD CARBON	4.7K OHM 5% 1/4W
R	37	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R	38	1	ERD25TJ223V	R:FXD CARBON	22K OHM 5% 1/4W
R	42	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R	43	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R	44	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	45	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R	50	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W

MKR-1-C DWG NO 4G203365

REF NO	QTY	PART NO	DESCRIPTION	
U 1	1	SN74LS93N	IC:TTL LS	4-BIT BINARY COUNTER
U 2	1	SN74LS42AN	IC:TTL LS	BCD-DECIMAL DECODER
U 3	1	SN74LS04N	IC:TTL LS	HEX INVERTER
U 4	1	SN74LS08N	IC:TTL LS	QUAD 2-INPUT AND GATE
U 11	1	UPC271C	IC:COMPARATOR	
U 12	1	SN74LS00N	IC:TTL LS	QUAD 2-INPUT NAND GATE
U 13	1	SN74LS00N	IC:TTL LS	QUAD 2-INPUT NAND GATE
U 14	1	SN74LS08N	IC:TTL LS	QUAD 2-INPUT AND GATE
U 15	1	SN74LS00N	IC:TTL LS	QUAD 2-INPUT NAND GATE
U 21	1	UPC451C	IC:OP AMP	QUAD
U 22	1	UPC451C	IC:OP AMP	QUAD
VR 11	1	RD13EB3	DIODE:ZENER	13.2V 500MW
VR 12	1	RD13EB3	DIODE:ZENER	13.2V 500MW
VR 13	1	RD13EB3	DIODE:ZENER	13.2V 500MW
VR 14	1	RD13EB3	DIODE:ZENER	13.2V 500MW
VR 15	1	RD13EB3	DIODE:ZENER	13.2V 500MW

PANEL DWG NO 4G203368

REF NO	QTY	PART NO	DESCRIPTION	
P 5	1	M3305S13	CONNECTOR:PIN	5P L:300
R 55	1	EVSN2AS15B15	R:VAR COMP	100K OHM 10% 1/2W
R 56	1	EVSN2AS15B55	R:VAR COMP	500K OHM 10% 1/2W

REF	NO	QTY	PART NO	DESCRIPTION	
			OVERALL	DWG NO 4G203428	
		1	78W05	P8920B CABLE ASSY	
		1	78W06	P8915J CABLE ASSY	
C	1	1	ECEB1VS470	C:FXD AL ELECT	47UF +-20% 35V
C	2	1	ECKD1E104ZFZ	C:FXD CER HI-K	100000PF +80-20% 25V
C	3	1	ECQM4104MZ	C:FXD FLM	0.1UF 20% 400V
CR	1	1	SF1	DIODE:SWITCHING	300MA 1500V
E	1	1	4G644260-0GB	TERMINAL:PROTECTIV EARTH	
E	2	1	CM2	CONNECTOR	POWER AC125V 15A
F	**	1	TSC1A	FUSE	1A 250V 20MM
F	1	1	TSC1A	FUSE	1A 250V 20MM
J	1	1	UG625UNI	CONNECTOR:COAX	BNC PANEL JACK
L	1	1	0L002	COIL:FXD	
P	1	1	M3110S13	CONNECTOR:PIN	10P L:300
Q	1	1	2SB691-PQ	TSTR:GE PNP	PC:600MW FT:7MHZ
R	1	1	ERD25TJ681V	R:FXD CARBON	680 OHM 5% 1/4W
R	2	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R	3	1	EVHZ03Z06B14	R:VAR CARBON	10K OHM 20% 1/5W
R	4	1	ERG2ANJ471	R:FXD MET OXD	470 OHM 5% 2W
R	5	1	ERD25TJ472V	R:FXD CARBON	4.7K OHM 5% 1/4W
S	1	1	ESB701T	PUSHB SW	DPDT 3A-250V AC
S	2	1	4G410473	P8811A ROTARY SW	ATT
T	1	1	3G430386-1	P8911A TRANSFORMER	PWR
T	2	1	74T004	P8920B TRANSFORMER	HV
V	1	1	230BLB4	CRT	9-INCH
W	1	1	77W02	CABLE:PWR (UL,CSA)	125V 10A
XF	1	1	SN2250	FUSE HOLDER	10A 250V
XV	1	1	TV801	CRT SOCKET	

MONITOR-C DWG NO 4G203478

REF NO	QTY	PART NO	DESCRIPTION	
C 1	1	ECKW2H102MD	C:FXD CER HI-K	1000PF +-20% 500V
C 2	1	ECEA1CS101	C:FXD AL ELECT	100UF +-20% 16V
C 3	1	ECEA1AS101	C:FXD AL ELECT	100UF +-20% 10V
C 4	1	ECQP1223GZ	C:FXD FLM	0.022UF 2% 100V
C 5	1	ECQP1224GZ	C:FXD FLM	0.22UF 2% 100V
C 6	1	ECEA1AS101	C:FXD AL ELECT	100UF +-20% 10V
C 7	1	ECEA1CS100	C:FXD AL ELECT	10UF +-20% 16V
C 8	1	ECEA1AS470	C:FXD AL ELECT	47UF +-20% 10V
C 11	1	ECKF1H104ZV	C:FXD CER HI-K	0.1UF +80%-20% 50V
C 13	1	ECKW1H102KB5	C:FXD CER HI-K	1000PF +-10% 50V
C 14	1	ECCW1H680KC5	C:FXD CER TC	68PF +-10% 50V NPO
C 15	1	ECKW1H102KB5	C:FXD CER HI-K	1000PF +-10% 50V
C 21	1	ECEA1AS101	C:FXD AL ELECT	100UF +-20% 10V
C 22	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 24	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 25	1	ECET16R472SW	C:FXD AL ELECT	4700UF +30%-10% 16V
C 26	1	ECET16R472SW	C:FXD AL ELECT	4700UF +30%-10% 16V
C 27	1	ECKF1H473ZF	C:FXD CER HI-K	47000PF +80-20% 50V
C 28	1	ECEA1CS101	C:FXD AL ELECT	100UF +-20% 16V
C 29	1	ECEA1CS100	C:FXD AL ELECT	10UF +-20% 16V
C 30	1	ECKW1H102KB5	C:FXD CER HI-K	1000PF +-10% 50V
C 31	1	ECET35R472SW	C:FXD AL ELECT	4700UF +30%-10% 35V
C 32	1	ECKF1H104ZV	C:FXD CER HI-K	0.1UF +80%-20% 50V
C 33	1	ECKF1H104ZV	C:FXD CER HI-K	0.1UF +80%-20% 50V
C 34	1	ECKF1H104ZV	C:FXD CER HI-K	0.1UF +80%-20% 50V
C 35	1	ECKF1H104ZV	C:FXD CER HI-K	0.1UF +80%-20% 50V
C 51	1	ECKF1H104ZV	C:FXD CER HI-K	0.1UF +80%-20% 50V
C 52	1	ECKF1H104ZV	C:FXD CER HI-K	0.1UF +80%-20% 50V
C 55	1	ECKF1H103ZF	C:FXD CER HI-K	10000PF +80-20% 50V
CR 1	1	MA150TA	DIODE:SI	100MA 35V
CR 2	1	MA150TA	DIODE:SI	100MA 35V
CR 3	1	MA150TA	DIODE:SI	100MA 35V
CR 10	1	MA150TA	DIODE:SI	100MA 35V
CR 11	1	S3V10	DIODE:PWR RECT	3.5A 100V
CR 12	1	S3V10	DIODE:PWR RECT	3.5A 100V
CR 13	1	V06B	DIODE:SI	1.3A 600V
CR 14	1	V06B	DIODE:SI	1.3A 600V
CR 15	1	1S1544A	DIODE:SI	100MA 30V
CR 16	1	1S1544A	DIODE:SI	100MA 30V
DS 1	1	LN21	LED	RED
E 1	1	2G400643	P8915A PC BOARD	MONITOR

MONITOR-C DWG NO 4G203478

REF	NO	QTY	PART NO	DESCRIPTION	
J	1	1	M3310P01	CONNECTOR:PIN	10P STRAIGHT
J	2	1	M3310P01	CONNECTOR:PIN	10P STRAIGHT
J	3	1	M3310P01	CONNECTOR:PIN	10P STRAIGHT
J	4	1	M3310P01	CONNECTOR:PIN	10P STRAIGHT
J	5	1	M3305P01	CONNECTOR:PIN	5P STRAIGHT
Q	1	1	UPA71AM	TSTR:FET	PC:250MW
Q	2	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	3	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	4	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	5	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	6	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	7	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	8	1	2SD727-PQ	TSTR:SI NPN	PC:600MW FT:200MHZ
Q	9	1	2SD727-PQ	TSTR:SI NPN	PC:600MW FT:200MHZ
Q	11	1	2SC1226A-QR	TSTR:SI NPN	PC:10W FT:150MHZ
Q	12	1	2SC1226A-QR	TSTR:SI NPN	PC:10W FT:150MHZ
Q	13	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	14	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	15	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	16	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	17	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	18	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	19	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	20	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	21	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	22	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	23	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	25	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	26	1	2SB691-PQ	TSTR:GE PNP	PC:600MW FT:7MHZ
Q	27	1	2SA699A-QR	TSTR:SI PNP	PC:10W FT:150MHZ
Q	28	1	2SA777-RS	TSTR:SI PNP	PC:750MW FT:120MHZ
R	1A	1	EVKZ53Z56172	R:VAR CARBON	500K-10K OHM 20% 1/5W
R	1B	1	EVKZ53Z56172	R:VAR CARBON	500K-10K OHM 20% 1/5W
R	2	1	ERD25TJ474V	R:FXD CARBON	470K OHM 5% 1/4W
R	4	1	ERD25TJ223V	R:FXD CARBON	22K OHM 5% 1/4W
R	5	1	ERD25TJ154V	R:FXD CARBON	150K OHM 5% 1/4W
R	6	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R	7	1	ERD25TJ472V	R:FXD CARBON	4.7K OHM 5% 1/4W
R	8	1	ERD25TJ472V	R:FXD CARBON	4.7K OHM 5% 1/4W
R	9	1	ERD25TJ683V	R:FXD CARBON	68K OHM 5% 1/4W
R	10	1	ERD25TJ683V	R:FXD CARBON	68K OHM 5% 1/4W

MONITOR-C DWG NO 4G203478

REF NO	QTY	PART NO	DESCRIPTION	
R 11	1	ERD25TJ471V	R:FXD CARBON	470 OHM 5% 1/4W
R 12	1	EVTR4SA00B13	R:VAR CARBON	1K OHM 20% 1/4W
R 13	1	ERD25TJ472V	R:FXD CARBON	4.7K OHM 5% 1/4W
R 14	1	ERD25TJ472V	R:FXD CARBON	4.7K OHM 5% 1/4W
R 15	1	ERD25TJ182V	R:FXD CARBON	1.8K OHM 5% 1/4W
R 16	1	EVTR4SA00B14	R:VAR CARBON	10K OHM 20% 1/4W
R 17	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 18	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 19	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 20	1	ERX2ANJ1R5	R:FXD MET OXD	1.5 OHM 5% 2W
R 21	1	ERX2ANJ1R5	R:FXD MET OXD	1.5 OHM 5% 2W
R 22	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R 23	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R 25	1	ERD25TJ271V	R:FXD CARBON	270 OHM 5% 1/4W
R 26	1	ERD25TJ271V	R:FXD CARBON	270 OHM 5% 1/4W
R 30	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R 31	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R 31	1	ERD25TJ223V	R:FXD CARBON	22K OHM 5% 1/4W
R 32	1	ERD25TJ822V	R:FXD CARBON	8.2K OHM 5% 1/4W
R 33	1	ERD25TJ153V	R:FXD CARBON	15K OHM 5% 1/4W
R 34	1	ERD25TJ332V	R:FXD CARBON	3.3K OHM 5% 1/4W
R 35	1	ERD25TJ332V	R:FXD CARBON	3.3K OHM 5% 1/4W
R 36	1	ERD25TJ332V	R:FXD CARBON	3.3K OHM 5% 1/4W
R 38	1	ERD25TJ223V	R:FXD CARBON	22K OHM 5% 1/4W
R 39	1	EVTR4SA00B14	R:VAR CARBON	10K OHM 20% 1/4W
R 40	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R 41	1	ERD25TJ332V	R:FXD CARBON	3.3K OHM 5% 1/4W
R 42	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R 43	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R 44	1	ERD25TJ332V	R:FXD CARBON	3.3K OHM 5% 1/4W
R 45	1	ERD25TJ681V	R:FXD CARBON	680 OHM 5% 1/4W
R 46	1	EVTR4SA00B13	R:VAR CARBON	1K OHM 20% 1/4W
R 47	1	ERD25TJ681V	R:FXD CARBON	680 OHM 5% 1/4W
R 48	1	ERD25TJ471V	R:FXD CARBON	470 OHM 5% 1/4W
R 49	1	ERD25TJ471V	R:FXD CARBON	470 OHM 5% 1/4W
R 50	1	ERD25TJ4R7V	R:FXD CARBON	4.7 OHM 5% 1/4W
R 51	1	ERD25TJ4R7V	R:FXD CARBON	4.7 OHM 5% 1/4W
R 60	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R 61	1	ERD25TJ473V	R:FXD CARBON	47K OHM 5% 1/4W
R 63	1	ERD25TJ152V	R:FXD CARBON	1.5K OHM 5% 1/4W
R 64	1	ERD25TJ682V	R:FXD CARBON	6.8K OHM 5% 1/4W
R 65	1	ERD25TJ472V	R:FXD CARBON	4.7K OHM 5% 1/4W
R 66	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R 67	1	ERD25TJ682V	R:FXD CARBON	6.8K OHM 5% 1/4W
R 68	1	EVTR4SA00B14	R:VAR CARBON	10K OHM 20% 1/4W

MONITOR-C DWG NO 4G203478

REF	NO	QTY	PART NO	DESCRIPTION	
R	69	1	ERD25TJ101V	R:FXD CARBON	100 OHM 5% 1/4W
R	71	1	ERD25TJ682V	R:FXD CARBON	6.8K OHM 5% 1/4W
R	73	1	ERD25TJ392V	R:FXD CARBON	3.9K OHM 5% 1/4W
R	74	1	ERD25TJ333V	R:FXD CARBON	33K OHM 5% 1/4W
R	75	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R	76	1	ERD25TJ154V	R:FXD CARBON	150K OHM 5% 1/4W
R	77	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R	78	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R	79	1	ERD25TJ101V	R:FXD CARBON	100 OHM 5% 1/4W
R	80	1	ERD25TJ223V	R:FXD CARBON	22K OHM 5% 1/4W
R	81	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R	82	1	ERD25TJ123V	R:FXD CARBON	12K OHM 5% 1/4W
R	83	1	ERD25TJ332V	R:FXD CARBON	3.3K OHM 5% 1/4W
R	84	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R	85	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R	86	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R	90	1	ERD25TJ472V	R:FXD CARBON	4.7K OHM 5% 1/4W
R	91	1	ERD25TJ474V	R:FXD CARBON	470K OHM 5% 1/4W
R	93	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R	94	1	ERC12GJ105	R:FXD COMP	1M OHM 5% 1/2W
R	95	1	EVTR4SA00B54	R:VAR CARBON	50K OHM 20% 1/4W
R	96	1	ERD25TJ223V	R:FXD CARBON	22K OHM 5% 1/4W
R	97	1	ERC12GK335	R:FXD COMP	3.3M OHM 10% 1/2W
R	98	1	EVTR4SA00B55	R:VAR CARBON	500K OHM 20% 1/4W
R	99	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	100	1	EVHZ05Z08B15	R:VAR CARBON	100K OHM 20% 1/5W
R	101	1	ERD25TJ471V	R:FXD CARBON	470 OHM 5% 1/4W
R	102	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R	103	1	ERD25TJ333V	R:FXD CARBON	33K OHM 5% 1/4W
R	104	1	EVTR4SA00B24	R:VAR CARBON	20K OHM 20% 1/4W
R	105	1	ERG1ANJ680	R:FXD MET OXD	68 OHM 5% 1W
R	141A	1	EVKZ53Z56B14	R:VAR CARBON	10K X2 OHM 20% 1/5W
R	141B	1	EVKZ53Z56B14	R:VAR CARBON	10K X2 OHM 20% 1/5W
R	151	1	ERD25TJ331V	R:FXD CARBON	330 OHM 5% 1/4W
R	154	1	ERO25CKF1502	R:FXD MET FLM	15K OHM 1% 1/4W
R	155	1	ERD25TJ271V	R:FXD CARBON	270 OHM 5% 1/4W
R	156	1	EVTR4SA00B13	R:VAR CARBON	1K OHM 20% 1/4W
R	158	1	ERO25CKF2431	R:FXD MET FLM	2.43K OHM 1% 1/4W
R	159	1	ERX1ANJR82	R:FXD MET OXD	0.82 OHM 5% 1W
R	161	1	ERC12GJ105	R:FXD COMP	1M OHM 5% 1/2W
R	162	1	EVTR4SA00B55	R:VAR CARBON	500K OHM 20% 1/4W
R	200	1	ERD25TJ101V	R:FXD CARBON	100 OHM 5% 1/4W

MONITOR-C DWG NO 4G203478

REF NO	QTY	PART NO	DESCRIPTION	
U 1	1	UPC451C	IC:OP AMP	QUAD
U 2	1	UPC151C	IC:OP AMP	
U 3	1	UPC142A	IC:V RGLTR	NEGATIVE ADJUSTABLE REG
U 4	1	UPC157C	IC:OP AMP	
XDS 1	1	163683-1	CONNECTOR:PIN	CIS 3P 2.5PITCH

MONITOR-E DWG NO 4G203479

REF NO	QTY	PART NO	DESCRIPTION	
CR 5	1	MA150TA	DIODE:SI	100MA 35V
CR 7	1	MA150TA	DIODE:SI	100MA 35V
CR 8	1	MA150TA	DIODE:SI	100MA 35V
CR 9	1	MA150TA	DIODE:SI	100MA 35V
E 1	1	CM2	CONNECTOR	POWER AC125V 15A
E 2	1	R76K-SR5P4	BUSHING-SR-5P-4	
F **	1	TSC1A	FUSE	1A 250V 20MM
F 1	1	TSC1A	FUSE	1A 250V 20MM
R 106	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R 107	1	EVTR4SA00B14	R:VAR CARBON	10K OHM 20% 1/4W
R 108	1	ERD25TJ101V	R:FXD CARBON	100 OHM 5% 1/4W
R 109	1	EVTR4SA00B53	R:VAR CARBON	5K OHM 20% 1/4W
R 111	1	ERD25TJ183V	R:FXD CARBON	18K OHM 5% 1/4W
R 112	1	EVTR4SA00B14	R:VAR CARBON	10K OHM 20% 1/4W
R 113	1	ERD25TJ124V	R:FXD CARBON	120K OHM 5% 1/4W
R 115	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 116	1	EVTR4SA00B13	R:VAR CARBON	1K OHM 20% 1/4W
R 118	1	ERD25TJ153V	R:FXD CARBON	15K OHM 5% 1/4W
R 119	1	EVTR4SA00B15	R:VAR CARBON	100K OHM 20% 1/4W
R 123	1	ERD25TJ473V	R:FXD CARBON	47K OHM 5% 1/4W
R 126	1	ERD25TJ224V	R:FXD CARBON	220K OHM 5% 1/4W
R 128	1	ERD25TJ823V	R:FXD CARBON	82K OHM 5% 1/4W
R 129	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R 130	1	ERD25TJ153V	R:FXD CARBON	15K OHM 5% 1/4W
R 131	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R 133	1	ERD25TJ563V	R:FXD CARBON	56K OHM 5% 1/4W
R 134	1	ERD25TJ474V	R:FXD CARBON	470K OHM 5% 1/4W
R 135	1	ERD25TJ473V	R:FXD CARBON	47K OHM 5% 1/4W
R 136	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R 137	1	ERD25TJ153V	R:FXD CARBON	15K OHM 5% 1/4W
R 138	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R 139	1	ERD25TJ150V	R:FXD CARBON	15 OHM 5% 1/4W
R 152	1	ERO25CKF4991	R:FXD MET FLM	4.99K OHM 1% 1/4W
R 157	1	ERO25CKF6981	R:FXD MET FLM	6.98K OHM 1% 1/4W
W 1	1	77W02	CABLE:PWR (UL,CSA)	125V 10A

VTO DWG NO 4G203482

REF NO	QTY	PART NO	DESCRIPTION	
	1	4G633428-0L	LABEL:MOS CAUTION	
C 1	1	ECCF1H470KU	C:FXD CER TC	47PF +-10% 50V N750
C 2	1	ECCF1H040DU	C:FXD CER TC	4PF +-0.5PF 50V N750
C 3	1	ECCF1H040DU	C:FXD CER TC	4PF +-0.5PF 50V N750
C 4	1	ECEA1CS220	C:FXD AL ELECT	22UF +-20% 16V
C 5	1	ECKW1H223ZF5	C:FXD CER HI-K	22000PF +80-20% 50V
C 6	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 7	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 8	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 9	1	ECCW1H470KC5	C:FXD CER TC	47PF +-10% 50V NPO
C 10	1	ECCW1H330KC5	C:FXD CER TC	33PF +-10% 50V NPO
C 11	1	ECCW1H330KC5	C:FXD CER TC	33PF +-10% 50V NPO
C 12	1	ECCW1H060DC5	C:FXD CER TC	6PF +-0.5PF 50V NPO
C 13	1	ECCW1H470KC5	C:FXD CER TC	47PF +-10% 50V NPO
C 14	1	ECCW1H020CC5	C:FXD CER TC	2PF +-0.25PF 50V NPO
C 15	1	ECCW1H330KC5	C:FXD CER TC	33PF +-10% 50V NPO
C 16	1	ECEA1AS470	C:FXD AL ELECT	47UF +-20% 10V
C 17	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 18	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 19	1	ECKF1H104ZV	C:FXD CER HI-K	0.1UF +80%-20% 50V
C 20	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 21	1	ECCW1H270KC5	C:FXD CER TC	27PF +-10% 50V NPO
C 22	1	ECCW1H150KC5	C:FXD CER TC	15PF +-10% 50V NPO
C 23	1	ECCW1H331K5	C:FXD CER TC	330PF +-10% 50V SL
C 24	1	ECEA1CS470	C:FXD AL ELECT	47UF +-20% 16V
C 25	1	ECKW1H103ZF5	C:FXD CER HI-K	10000PF +80-20% 50V
C 26	1	ECCW1H101KC5	C:FXD CER TC	100PF +-10% 50V NPO
C 27	1	ECKW1H102KB5	C:FXD CER HI-K	1000PF +-10% 50V
C 28	1	ECKW1H223ZF5	C:FXD CER HI-K	22000PF +80-20% 50V
C 29	1	ECKW1H223ZF5	C:FXD CER HI-K	22000PF +80-20% 50V
C 30	1	ECKW1H472MD5	C:FXD CER HI-K	4700PF +-20% 50V
C 31	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 32	1	ECKF1H104ZV	C:FXD CER HI-K	0.1UF +80%-20% 50V
C 33	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 34	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 35	1	ECEA1CS220	C:FXD AL ELECT	22UF +-20% 16V
C 41	1	ECKW1H472MD5	C:FXD CER HI-K	4700PF +-20% 50V
C 42	1	SR305E105Z	C:FXD CER MULTILAYER	1UF +-1% 25V
C 43	1	ECKW1H103ZF5	C:FXD CER HI-K	10000PF +80-20% 50V
C 44	1	SR305E105Z	C:FXD CER MULTILAYER	1UF +-1% 25V
C 45	1	ECKW1H223ZF5	C:FXD CER HI-K	22000PF +80-20% 50V

VTO DWG NO 4G203482

REF NO	QTY	PART NO	DESCRIPTION	
C 46	1	SR305E105Z	C:FXD CER MULTILAYER	1UF +-1% 25V
C 47	1	SR305E105Z	C:FXD CER MULTILAYER	1UF +-1% 25V
C 49	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 51	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 52	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 53	1	ECEA1CS470	C:FXD AL ELECT	47UF +-20% 16V
C 54	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 55	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 56	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 57	1	ECEA1AS470	C:FXD AL ELECT	47UF +-20% 10V
C 58	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
CR 1	1	MA322-MC	DIODE:SI	20MA 30V
CR 2	1	MA322-MC	DIODE:SI	20MA 30V
CR 5	1	1SV34	DIODE:PIN	50MA 100V
CR 6	1	MA150TA	DIODE:SI	100MA 35V
CR 7	1	1SS16	DIODE:SCHOTTKY	30MA 5V
CR 8	1	MA150TA	DIODE:SI	100MA 35V
CR 11	1	MA56	DIODE:SI	100MA 20V
CR 12	1	MA56	DIODE:SI	100MA 20V
CR 13	1	MA56	DIODE:SI	100MA 20V
CR 14	1	MA56	DIODE:SI	100MA 20V
CR 15	1	MA56	DIODE:SI	100MA 20V
CR 16	1	MA56	DIODE:SI	100MA 20V
E 1	1	3G400856-1	P8913A PC BOARD	VTO
J 1	1	77J01	Q075A84 CONNECTOR	BNC PANEL JACK
J 2	1	UMQR1	CONNECTOR:COAX	RECEPT
L 1	1	4G431199	P8814A SWP COIL	
L 2	1	TP0206LR82K	COIL:CHOKE	0.82UH 10%
L 3	1	TP0206L1R0K	COIL:CHOKE	1.0UH 10%
L 4	1	4G431203	P8814A 75MHZ	
L 5	1	3L0004	FERRITE CORE	
L 6	1	3L0004	FERRITE CORE	
L 7	1	3L0004	FERRITE CORE	
L 8	1	3L0004	FERRITE CORE	
P 1	1	M3110S13	CONNECTOR:PIN	10P L:300
Q 1	1	2SC1215	TSTR:SI NPN	PC:200MW FT:1200MHZ
Q 2	1	2SC1215	TSTR:SI NPN	PC:200MW FT:1200MHZ
Q 3	1	2SC1215	TSTR:SI NPN	PC:200MW FT:1200MHZ
Q 4	1	2SC1215	TSTR:SI NPN	PC:200MW FT:1200MHZ
Q 5	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ

VTO DWG NO 4G203482

REF	NO	QTY	PART NO	DESCRIPTION	
Q	6	1	2SC1215	TSTR:SI NPN	PC:200MW FT:1200MHZ
Q	7	1	2SC1215	TSTR:SI NPN	PC:200MW FT:1200MHZ
Q	8	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	11	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	12	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	13	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	14	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	15	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	16	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	17	1	2SC828A-RS	TSTR:SI NPN	PC:250MW FT:220MHZ
Q	18	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
Q	19	1	2SA564A-RS	TSTR:SI PNP	PC:250MW FT:80MHZ
R	1	1	ERD25TJ470V	R:FXD CARBON	47 OHM 5% 1/4W
R	2	1	ERD25TJ474V	R:FXD CARBON	470K OHM 5% 1/4W
R	3	1	ERD25TJ474V	R:FXD CARBON	470K OHM 5% 1/4W
R	5	1	ERD25TJ100V	R:FXD CARBON	10 OHM 5% 1/4W
R	6	1	ERD25TJ100V	R:FXD CARBON	10 OHM 5% 1/4W
R	7	1	ERD25TJ333V	R:FXD CARBON	33K OHM 5% 1/4W
R	8	1	ERD25TJ333V	R:FXD CARBON	33K OHM 5% 1/4W
R	9	1	ERD25TJ123V	R:FXD CARBON	12K OHM 5% 1/4W
R	10	1	ERD25TJ332V	R:FXD CARBON	3.3K OHM 5% 1/4W
R	11	1	ERD25TJ682V	R:FXD CARBON	6.8K OHM 5% 1/4W
R	12	1	ERD25TJ431V	R:FXD CARBON	430 OHM 5% 1/4W
R	13	1	ERD25TJ221V	R:FXD CARBON	220 OHM 5% 1/4W
R	14	1	ERD25TJ181V	R:FXD CARBON	180 OHM 5% 1/4W
R	15	1	ERO25CKF1821	R:FXD MET FLM	1.82K OHM 1% 1/4W
R	16	1	ERO25CKF1821	R:FXD MET FLM	1.82K OHM 1% 1/4W
R	17	1	ERD25TJ273V	R:FXD CARBON	27K OHM 5% 1/4W
R	18	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R	21	1	ERD25TJ241V	R:FXD CARBON	240 OHM 5% 1/4W
R	22	1	ERD25TJ101V	R:FXD CARBON	100 OHM 5% 1/4W
R	23	1	ERO25CKF1211	R:FXD MET FLM	1.21K OHM 1% 1/4W
R	24	1	ERD25TJ474V	R:FXD CARBON	470K OHM 5% 1/4W
R	25	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R	31	1	ERD25TJ333V	R:FXD CARBON	33K OHM 5% 1/4W
R	32	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R	33	1	ERD25TJ100V	R:FXD CARBON	10 OHM 5% 1/4W
R	34	1	ERD25TJ102V	R:FXD CARBON	1K OHM 5% 1/4W
R	*34	1	ERD25TJ332V	R:FXD CARBON	3.3K OHM 5% 1/4W
R	35	1	ERD25TJ122V	R:FXD CARBON	1.2K OHM 5% 1/4W
R	36	1	ERD25TJ103V	R:FXD CARBON	10K OHM 5% 1/4W
R	37	1	ERD25TJ334V	R:FXD CARBON	330K OHM 5% 1/4W

VTO DWG NO 4G203482

REF NO	QTY	PART NO	DESCRIPTION	
R 38	1	ERD25TJ333V	R:FXD CARBON	33K OHM 5% 1/4W
R 39	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R 40	1	ERD25TJ681V	R:FXD CARBON	680 OHM 5% 1/4W
R 41	1	ERD25TJ821V	R:FXD CARBON	820 OHM 5% 1/4W
R 42	1	ERD25TJ153V	R:FXD CARBON	15K OHM 5% 1/4W
R 43	1	ERD25TJ562V	R:FXD CARBON	5.6K OHM 5% 1/4W
R 44	1	ERD25TJ681V	R:FXD CARBON	680 OHM 5% 1/4W
R 45	1	ERD25TJ121V	R:FXD CARBON	120 OHM 5% 1/4W
R 46	1	ERD25TJ560V	R:FXD CARBON	56 OHM 5% 1/4W
R 51	1	ERO25CKF1211	R:FXD MET FLM	1.21K OHM 1% 1/4W
R 52	1	ERO25CKF10R2	R:FXD MET FLM	10.2 OHM 1% 1/4W
R 53	1	ERO25CKF11R5	R:FXD MET FLM	11.5 OHM 1% 1/4W
R 54	1	ERO25CKF1001	R:FXD MET FLM	1K OHM 1% 1/4W
R 55	1	ERO25CKF2000	R:FXD MET FLM	200 OHM 1% 1/4W
R 56	1	ERO25CKF3400	R:FXD MET FLM	340 OHM 1% 1/4W
R 57	1	ERO25CKF22R1	R:FXD MET FLM	22.1 OHM 1% 1/4W
R 58	1	ERO25CKF37R4	R:FXD MET FLM	37.4 OHM 1% 1/4W
R 59	1	ERO25CKF1001	R:FXD MET FLM	1K OHM 1% 1/4W
R 60	1	ERO25CKF2000	R:FXD MET FLM	200 OHM 1% 1/4W
R 61	1	ERO25CKF1370	R:FXD MET FLM	137 OHM 1% 1/4W
R 62	1	ERO25CKF22R1	R:FXD MET FLM	22.1 OHM 1% 1/4W
R 63	1	ERO25CKF68R1	R:FXD MET FLM	68.1 OHM 1% 1/4W
R 64	1	ERO25CKF1001	R:FXD MET FLM	1K OHM 1% 1/4W
R 65	1	ERO25CKF5620	R:FXD MET FLM	562 OHM 1% 1/4W
R 66	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 67	1	ERD25TJ153V	R:FXD CARBON	15K OHM 5% 1/4W
R 68	1	ERD25TJ221V	R:FXD CARBON	220 OHM 5% 1/4W
R 69	1	ERD25TJ183V	R:FXD CARBON	18K OHM 5% 1/4W
R 70	1	ERD25TJ682V	R:FXD CARBON	6.8K OHM 5% 1/4W
R 71	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 72	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 76	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 77	1	ERD25TJ153V	R:FXD CARBON	15K OHM 5% 1/4W
R 78	1	ERD25TJ221V	R:FXD CARBON	220 OHM 5% 1/4W
R 79	1	ERD25TJ183V	R:FXD CARBON	18K OHM 5% 1/4W
R 80	1	ERD25TJ682V	R:FXD CARBON	6.8K OHM 5% 1/4W
R 81	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 82	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 86	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 87	1	ERD25TJ153V	R:FXD CARBON	15K OHM 5% 1/4W
R 88	1	ERD25TJ221V	R:FXD CARBON	220 OHM 5% 1/4W
R 89	1	ERD25TJ183V	R:FXD CARBON	18K OHM 5% 1/4W
R 90	1	ERD25TJ682V	R:FXD CARBON	6.8K OHM 5% 1/4W
R 91	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W
R 92	1	ERD25TJ222V	R:FXD CARBON	2.2K OHM 5% 1/4W

VTO DWG NO 4G203482

REF	NO	QTY	PART NO	DESCRIPTION	
U	1	1	SN76514N	IC:TTL	DOUBLE BALANCED MIXER
U	2	1	UPC157C	IC:OP AMP	
Y	1	1	81A15	CRYSTAL:QUARTZ OSC	80MHZ (HC-18/U)

MKR-1-E DWG NO 4G203483

REF	NO	QTY	PART NO	DESCRIPTION	
C	9	1	ECSF25E4R7G	C:FXD TA ELECT	4.7UF 20% 25V
C	10	1	ECSF25E4R7G	C:FXD TA ELECT	4.7UF 20% 25V
C	11	1	ECSF25E2R2G	C:FXD TA ELECT	2.2UF 20% 25V
C	12	1	ECSF25E2R2G	C:FXD TA ELECT	2.2UF 20% 25V
C	13	1	ECSF25E2R2G	C:FXD TA ELECT	2.2UF 20% 25V
C	33	1	ECKW1H222MD5	C:FXD CER HI-K	2200PF +-20% 50V
P	3	1	M3110S13	CONNECTOR:PIN	10P L:300
R	1	1	ERD25TJ101V	R:FXD CARBON	100 OHM 5% 1/4W
R	2	1	ERD25TJ101V	R:FXD CARBON	100 OHM 5% 1/4W
R	3	1	ERD25TJ101V	R:FXD CARBON	100 OHM 5% 1/4W
R	4	1	ERD25TJ101V	R:FXD CARBON	100 OHM 5% 1/4W
R	5	1	ERD25TJ101V	R:FXD CARBON	100 OHM 5% 1/4W

MKR-2 DWG NO 4G203484

REF NO	QTY	PART NO	DESCRIPTION	
	1	4G633428-0L	LABEL:MOS CAUTION	
C 1	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 2	1	ECKW1H102KB5	C:FXD CER HI-K	1000PF +-10% 50V
C 3	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 4	1	ECSF10E10	C:FXD TA ELECT	10UF 20% 10V
C 5	1	ECKW1H221KB5	C:FXD CER HI-K	220PF +-10% 50V
C 6	1	ECCW1H220KC5	C:FXD CER TC	22PF +-10% 50V NPO
C 7	1	ECKW1H221KB5	C:FXD CER HI-K	220PF +-10% 50V
C 8	1	ECCW1H330KC5	C:FXD CER TC	33PF +-10% 50V NPO
C 9	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 10	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 11	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 12	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 13	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 14	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 15	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 16	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 17	1	ECEB1AS101	C:FXD AL ELECT	100UF +-20% 10V
C 18	1	ECEB1AS101	C:FXD AL ELECT	100UF +-20% 10V
C 19	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 20	1	ECEB1CS101	C:FXD AL ELECT	100UF +-20% 16V
C 21	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 22	1	ECKF1H473ZV	C:FXD CER HI-K	0.047UF +80%-20% 50V
C 25	1	ECCW1H020CC5	C:FXD CER TC	2PF +-0.25PF 50V NPO
C 30	1	ECCF1H101KC	C:FXD CER TC	100PF +-10% 50V NPO
E 1	1	3G400964	P8913B PC BOARD	MARKER (2)
P 1	1	M3310P01	CONNECTOR:PIN	10P STRAIGHT
P 2	1	M3115P01	CONNECTOR:PIN	15P
P 3	1	M3305S13	CONNECTOR:PIN	5P L:300
P 4	1	M3110S13	CONNECTOR:PIN	10P L:300
P 5	1	M3110S13	CONNECTOR:PIN	10P L:300
P 6	1	UMQP1-5	CONNECTOR:COAX	PLUG
Q 1	1	2SC1215	TSTR:SI NPN	PC:200MW FT:1200MHZ
Q 2	1	2SC1215	TSTR:SI NPN	PC:200MW FT:1200MHZ
R 1	1	ERD25TJ560V	R:FXD CARBON	56 OHM 5% 1/4W
R 2	1	ERD25TJ822V	R:FXD CARBON	8.2K OHM 5% 1/4W
R 3	1	ERD25TJ562V	R:FXD CARBON	5.6K OHM 5% 1/4W
R 4	1	ERD25TJ152V	R:FXD CARBON	1.5K OHM 5% 1/4W
R 5	1	ERD25TJ470V	R:FXD CARBON	47 OHM 5% 1/4W

MKR-2 DWG NO 4G203484

REF	NO	QTY	PART NO	DESCRIPTION	
R	6	1	ERD25TJ152V	R:FXD CARBON	1.5K OHM 5% 1/4W
R	7	1	ERD25TJ391V	R:FXD CARBON	390 OHM 5% 1/4W
R	8	1	ERD25TJ182V	R:FXD CARBON	1.8K OHM 5% 1/4W
R	9	1	ERD25TJ152V	R:FXD CARBON	1.5K OHM 5% 1/4W
R	10	1	ERD25TJ152V	R:FXD CARBON	1.5K OHM 5% 1/4W
R	12	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	13	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	14	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	15	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	16	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	17	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	18	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	19	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	20	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	21	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	22	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	23	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	24	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	25	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	26	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	27	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	28	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	29	1	ERD25TJ104V	R:FXD CARBON	100K OHM 5% 1/4W
R	30	1	ERD25TJ472V	R:FXD CARBON	4.7K OHM 5% 1/4W
R	31	1	ERD25TJ472V	R:FXD CARBON	4.7K OHM 5% 1/4W
R	32	1	ERD25TJ472V	R:FXD CARBON	4.7K OHM 5% 1/4W
R	35	1	ERD25TJ333V	R:FXD CARBON	33K OHM 5% 1/4W
U	1	1	CMOS4049BP	IC:C MOS	HEX INV BUFFER/CONVERTE
U	2	1	CMOS4049BP	IC:C MOS	HEX INV BUFFER/CONVERTE
U	3	1	CMOS4049BP	IC:C MOS	HEX INV BUFFER/CONVERTE
U	4	1	SN74LS107N	IC:TTL LS	DUAL J-K FLIP-FLOP
U	5	1	SN74LS00N	IC:TTL LS	QUAD 2-INPUT NAND GATE
U	11	1	SN74LS05N	IC:TTL LS	HEX INVERTER O/C
U	12	1	SN74196N	IC:TTL	DECADE COUNTER
U	13	1	SN74LS192N	IC:TTL LS	REVERS DECADE COUNTER
U	14	1	SN74LS192N	IC:TTL LS	REVERS DECADE COUNTER
U	15	1	SN74LS192N	IC:TTL LS	REVERS DECADE COUNTER
U	16	1	SN74LS192N	IC:TTL LS	REVERS DECADE COUNTER
U	17	1	SN74LS00N	IC:TTL LS	QUAD 2-INPUT NAND GATE
U	18	1	SN7476N	IC:TTL	DUAL J-K FLIP-FLOP
U	21	1	SN74LS00N	IC:TTL LS	QUAD 2-INPUT NAND GATE
U	22	1	SN74LS93N	IC:TTL LS	4-BIT BINARY COUNTER
U	23	1	SN74LS90N	IC:TTL LS	DECADE COUNTER
U	24	1	SN74LS90N	IC:TTL LS	DECADE COUNTER
U	25	1	SN74LS90N	IC:TTL LS	DECADE COUNTER

MKR-2 DWG NO 4G203484

REF	NO	QTY	PART NO	DESCRIPTION	
Y	1	1	78A21	CRYSTAL:QUARTZ OSC	16MHZ (HC-18/U)

MATRIX DWG NO 4G203485

REF	NO	QTY	PART NO	DESCRIPTION	
E	1	1	2G400664	P8913B PC BOARD	MATRIX
E	2	1	A7M1P	ROTARY SW	SPACER
E	3	1	A7M1P	ROTARY SW	SPACER
E	4	1	A7M1P	ROTARY SW	SPACER
E	5	1	A7M1P	ROTARY SW	SPACER
E	6	1	A7M1M	ROTARY SW	PANEL
J	3	1	M3305P01	CONNECTOR:PIN	5P STRAIGHT
J	4	1	M3310P01	CONNECTOR:PIN	10P STRAIGHT
J	5	1	M3310P01	CONNECTOR:PIN	10P STRAIGHT
S	1	1	81S05	P8913B ROTARY SW	
S	2	1	81S05	P8913B ROTARY SW	
S	3	1	81S05	P8913B ROTARY SW	
S	4	1	81S05	P8913B ROTARY SW	
S	5	1	81S05	P8913B ROTARY SW	
S	6	1	81S05	P8913B ROTARY SW	
S	7	1	81S05	P8913B ROTARY SW	
S	8	1	81S05	P8913B ROTARY SW	
S	9	1	81S05	P8913B ROTARY SW	
S	10	1	81S05	P8913B ROTARY SW	
S	11	1	81S05	P8913B ROTARY SW	
S	12	1	81S05	P8913B ROTARY SW	
S	13	1	81S05	P8913B ROTARY SW	
S	14	1	81S05	P8913B ROTARY SW	
S	15	1	81S05	P8913B ROTARY SW	
S	16	1	81S05	P8913B ROTARY SW	
S	17	1	81S05	P8913B ROTARY SW	
S	18	1	81S05	P8913B ROTARY SW	
S	19	1	81S05	P8913B ROTARY SW	
S	20	1	81S05	P8913B ROTARY SW	
S	21	1	81S05	P8913B ROTARY SW	
S	22	1	81S05	P8913B ROTARY SW	
S	23	1	81S05	P8913B ROTARY SW	
S	24	1	81S05	P8913B ROTARY SW	
S	25	1	81S05	P8913B ROTARY SW	

MECHA-E DWG NO 4G301955

REF NO	QTY	PART NO	DESCRIPTION
	1	2G580544-0FA	P8913B PLATE,REAR
	1	2G580545-0W	P8913B PLATE,BOTTOM
	1	3G612404-0CB	P8911A HEAT SINK
	1	3G630794-1CH	P8913B PANEL,LOWER
	1	3G631019-0AH	P8913B PANEL
	1	4G550017-3N	P251A STAND
	2	4G601008-0W	P054V HOLDER ASSY D6
	2	4G614974-0PB	P251A NUT
	1	4G615567-1BB	P8911A BRACKET:VTO
	1	4G615724-0BB	P8913B CLAMP:SWITCH
	1	4G633291-1W	P8913B LABEL IDENT
	1	4G670059-1CB	P8811A CASE:UNIT
	2	4G760025-3G	P251A FOOT,RECTANGULAR
	4	4G760209-0G	FOOT D20

MECHA-C DWG NO 4G302221

REF NO	QTY	PART NO	DESCRIPTION
	1	A72G-74M001	FASTNER:CRT BAND
	1	A78P-76M006	P3830A VIEWING HOOD
	1	R76W-60743C	BAND:POWER CORD
	1	2G580547-0D	P8915A COVER,TOP
	1	2G590120-3FB	P8911A CHASSIS
	1	3G530014-4X	P383A DIAGRAM
	1	3G590144-0BB	P8911A FRAME
	1	3G660510-1AF	P8915A FRAME,FRONT
	1	3G760038-0C	KNOB,23F6A
	1	4G540024-0B	P385B SPRING
	2	4G540056-0F	P383A SPRING:FILTER
	1	4G550009-0E	HANDLE ASSEY,MIDDLE
	2	4G550020-0FF	P5250A HOLDER:HANDLE-M
	1	4G615562-0YB	P8811A COVER:TRANS
	1	4G615563-0AB	P8911A SUPPORT:TRANS
	2	4G615566-0AB	P8811A PLATE
	1	4G615569-0BB	P8911A PLATE:VR
	1	4G615570-0AB	P8911A HEATSINK
	1	4G615571-0BB	P8911A BRACKET
	1	4G616709-0LB	BAND,D6
	1	4G633026-0LB	P386A LABEL:CAUTION
	1	4G633436-0KA	P5510A LABEL:POWER
	1	4G633809-0KA	P9602A PLATE,LINI VOLT
	3	4G644152-3BB	STUD 3X5
	2	4G644162-1AB	SPACER 2.6X10
	1	4G670059-1CB	P8811A CASE:UNIT
	1	4G702233-2E	P8911A ROD POWER
	3	4G760123-0C	KNOB,12D3U
	2	4G760169-0X	P8911A CUSHIOH:TRANS
	1	4G760214-0C	KNOB,16N6A
	2	4G760223-0C	KNOB,16A6A

PACKAGE DWG NO 4G301956

REF NO	QTY	PART NO	DESCRIPTION
	1	3G710401-0N	BAG:PACKING
	1	380SJ1	KP-380 PACKING KIT
	1	4G712001-1N	BAG:ACCESSORY
	2	4G712045-0N	BAG,1B
	1	4G712170-0A	KP-380 CARTON BOX
	4	4G712171-0F	KP-380 CUSHION
	1	4G712176-0G	KP-380 CUSHION,FRONT
	1	MMP8913B-0	INSTRUCTION MANUAL

VP-8913B,J VP-8915B,J CIRCUIT DIAGRAMS

			8913B	8915B	8913J	8915J
1	OVERALL INTERCONNECTION	(A1)	*	*		
2	OVERALL INTERCONNECTION	(A1)			*	*
3	MONITOR	(A2)	*	*	*	*
4	8913B VTO	(A3)	*		*	
5	8915B VTO	(A3)		*		*
6	8913B MARKER	(A4) (A5)	*		*	
7	8915B MARKER	(A4) (A5)		*		*
8	8913B MATRIX	(A6)	*	*		
9	8913J MATRIX	(A7)			*	*
10	8913J MARKER	(A4)—(1)			*	
11	8915J MARKER	(A4)—(1)				*

NOTES

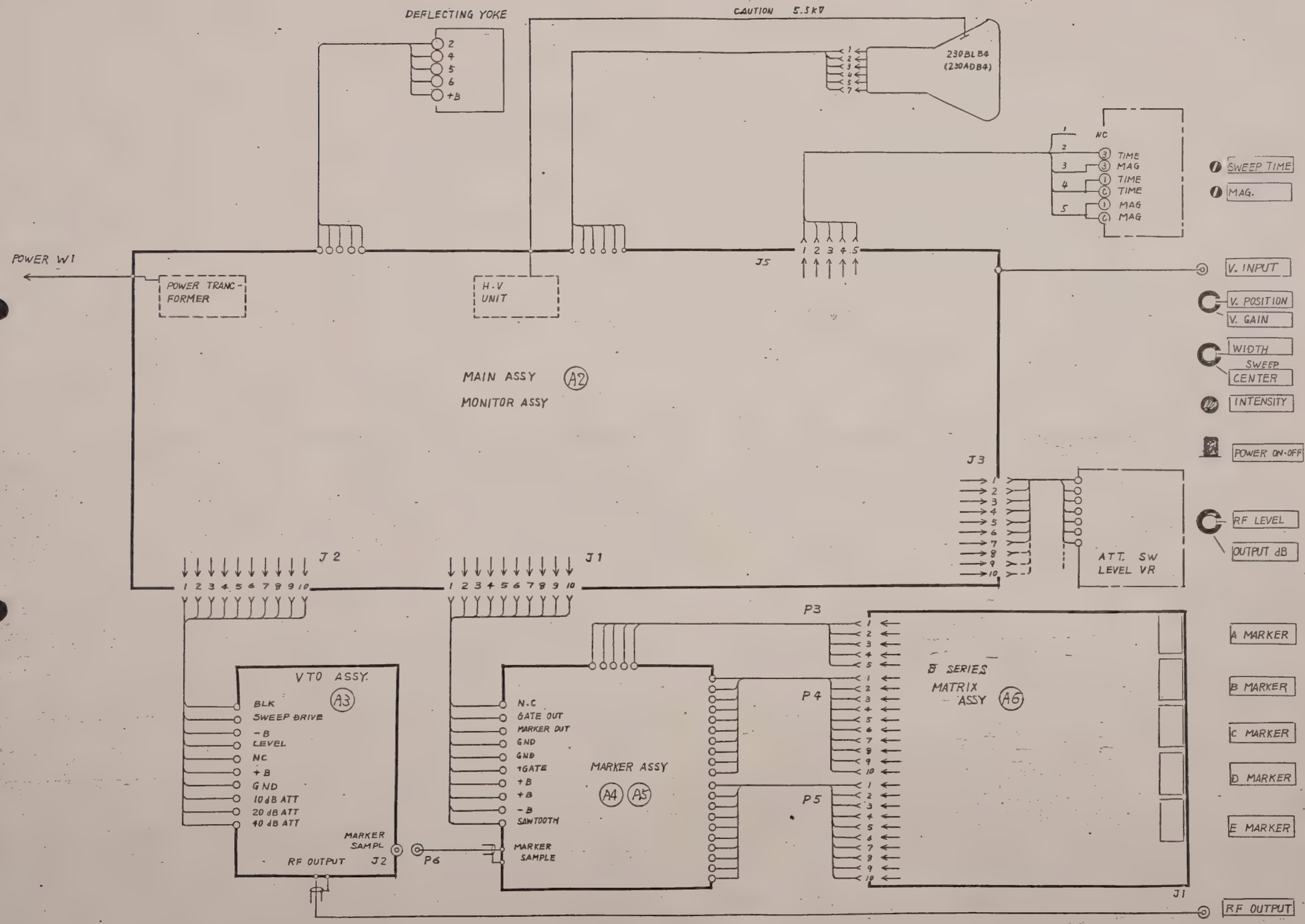
▷ WHEN THE CIRCUIT IS DIVIDED INTO SOME UNITS AND AN IDENTIFYING NUMBER IS ASSIGNED TO EACH UNIT, REFERENCE DESIGNATORS IN EACH CIRCUIT DIAGRAM ARE GIVEN IN ABBREVIATED FORM. PREFIX WITH EACH IDENTIFYING NUMBER FOR COMPLETE DESCRIPTION.
EXAMPLES; A1C1, A6R3.

▷ RESISTANCE VALUES IN OHMS AND CAPACITANCE IN PICOFARADS(FROM 1 TO 9,999) OR MICROFARADS (FROM 0.01 TO 0.99) UNLESS OTHERWISE NOTED.

▷ POWER RATINGS AND RESISTANCE TOLERANCES OF FIXED RESISTORS ARE 1/8 WATTS AND ±5 % UNLESS OTHERWISE NOTED.

▷ ✡ FACTORY REWORKED OR CHECKED COMPONENTS.

▷ ✱ VALUE SELECTED AT FACTORY, NOMINAL VALUE SHOWN.



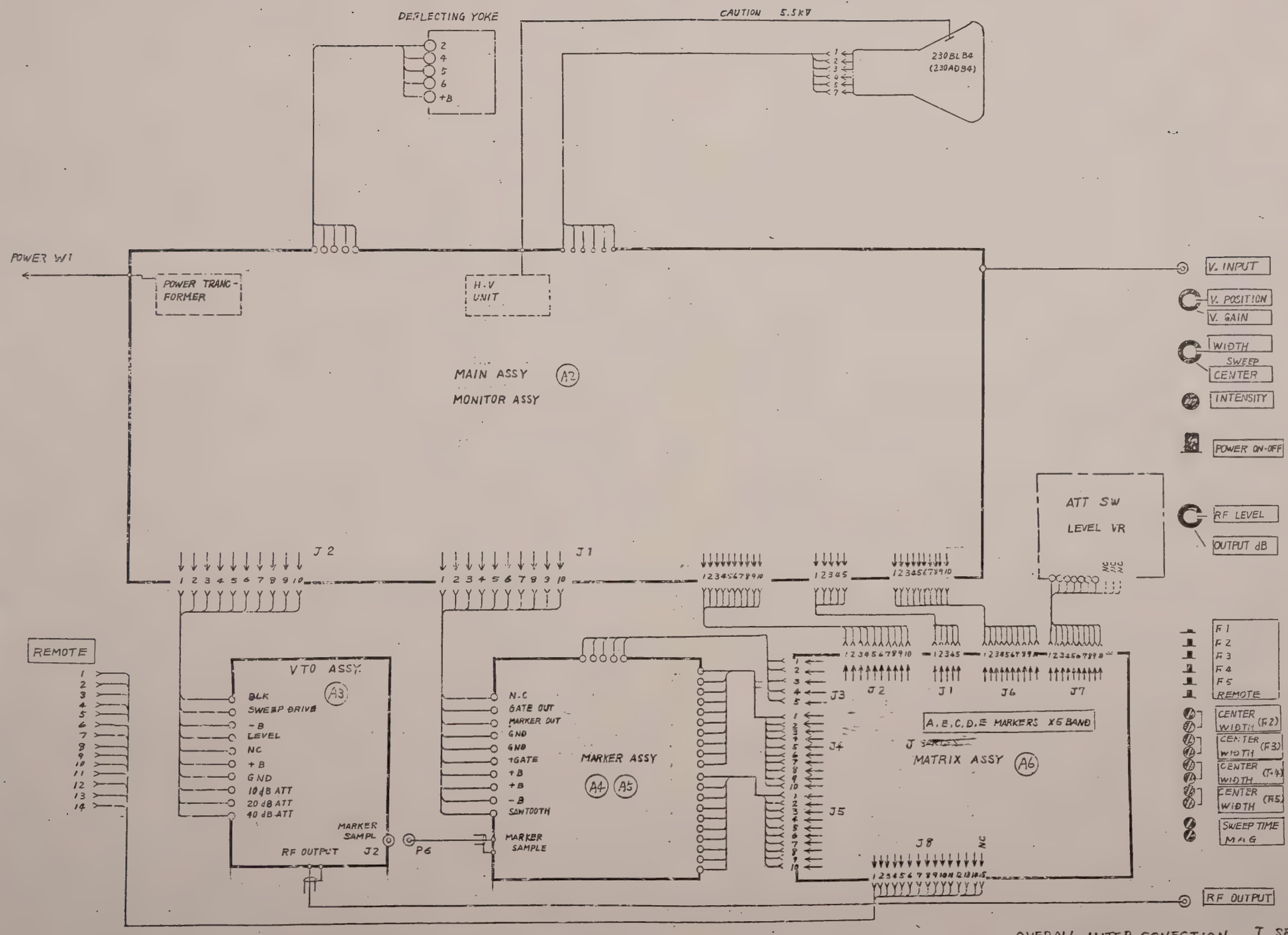
OVERALL INTER CONECTION B SERIES (A1)

1

S OHISHI

VP-8913B, VP-8915B

3G-13-0961/1

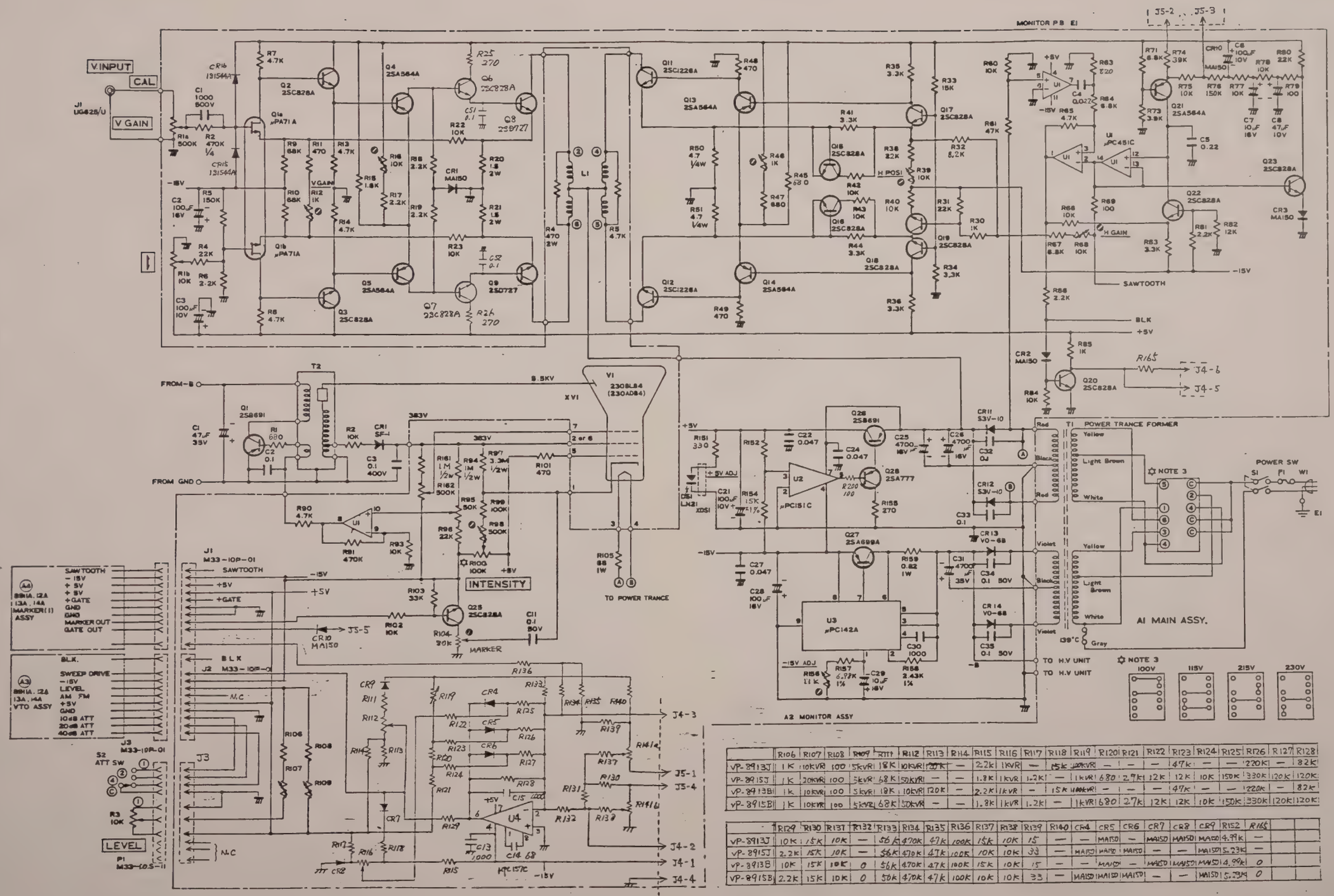


OVERALL INTER CONECTION J SERIES (A1) 2

S. OHISHI

VP-8913J, VP-8915J

3G-13-0957/1



	R106	R107	R108	R109	R111	R112	R113	R114	R115	R116	R117	R118	R119	R120	R121	R122	R123	R124	R125	R126	R127	R128
VP-8913J	1K	10KVR	100	5KVR	18K	10KVR	120K	—	2.2K	1KVR	—	15K	100KVR	—	—	—	47K	—	—	220K	—	82K
VP-8915J	1K	20KVR	100	5KVR	68K	50KVR	—	—	1.8K	1KVR	1.2K	—	1KVR	680	2.7K	12K	12K	10K	150K	330K	120K	120K
VP-8913B	1K	10KVR	100	5KVR	18K	10KVR	120K	—	2.2K	1KVR	—	15K	100KVR	—	—	—	47K	—	—	220K	—	82K
VP-8915B	1K	10KVR	100	5KVR	68K	50KVR	—	—	1.8K	1KVR	1.2K	—	1KVR	680	2.7K	12K	12K	10K	150K	330K	120K	120K

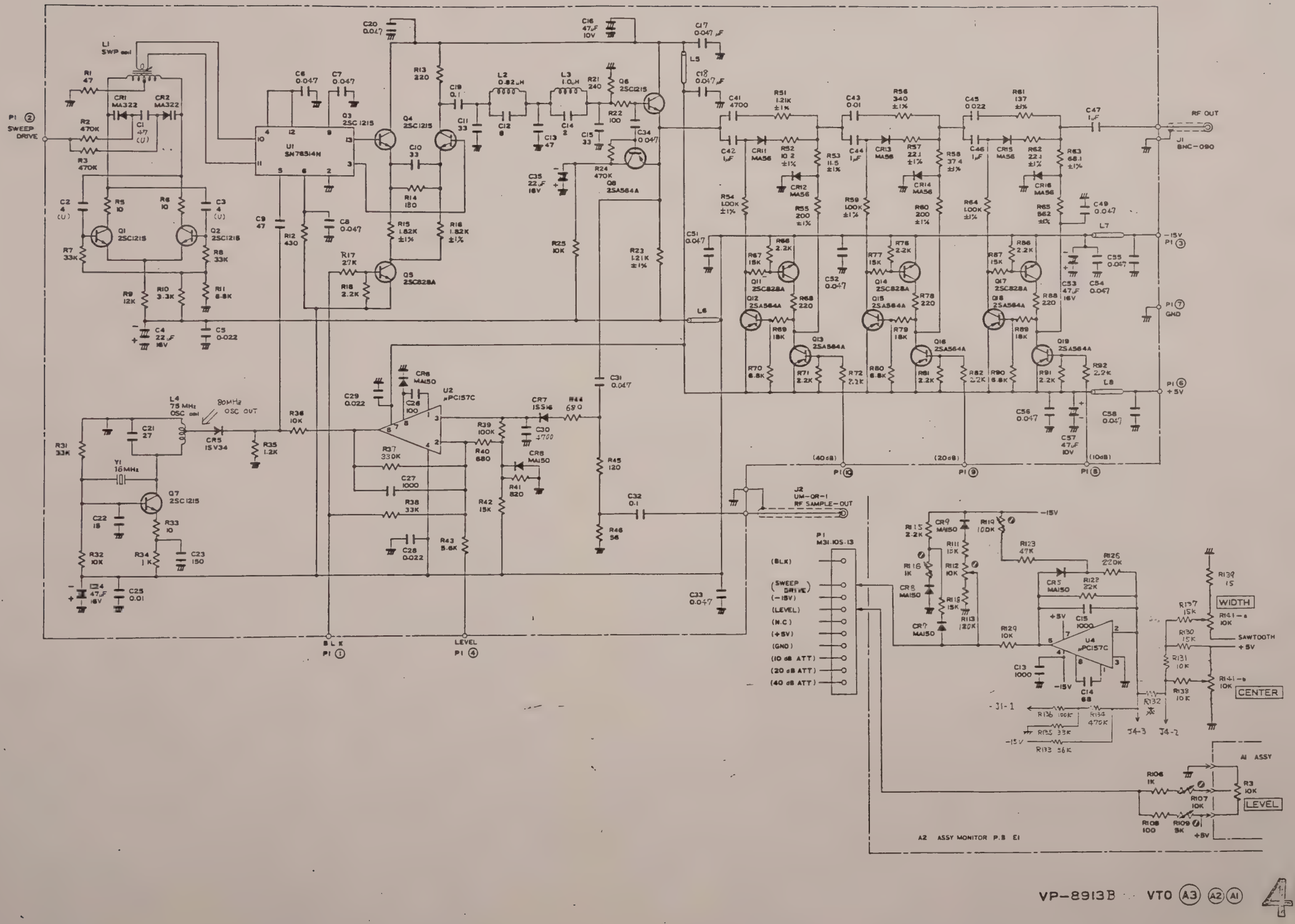
	R129	R130	R131	R132	R133	R134	R135	R136	R137	R138	R139	R140	CR4	CR5	CR6	CR7	CR8	CR9	R152	R165		
VP-8913J	10K	15K	10K	—	56K	470K	47K	100K	15K	10K	15	—	—	MA150	—	MA150	MA150	MA150	4.99K	—		
VP-8915J	2.2K	15K	10K	—	56K	470K	47K	100K	10K	10K	33	—	MA150	MA150	MA150	—	—	MA150	5.23K	—		
VP-8913B	10K	15K	10K	0	56K	470K	47K	100K	15K	10K	15	—	—	MA150	—	MA150	MA150	MA150	4.99K	0		
VP-8915B	2.2K	15K	10K	0	56K	470K	47K	100K	10K	10K	33	—	MA150	MA150	MA150	—	—	MA150	5.23K	0		

VP-8913B, VP-8915B
VP-8913J, VP-8915J

S. OHISHI

3G-113-0957/1

MONITOR (A2) 3



VP-8913B VTO (A3) (A2) (A1)

4

S. OHISHI

VP-8913B, VP-8913J

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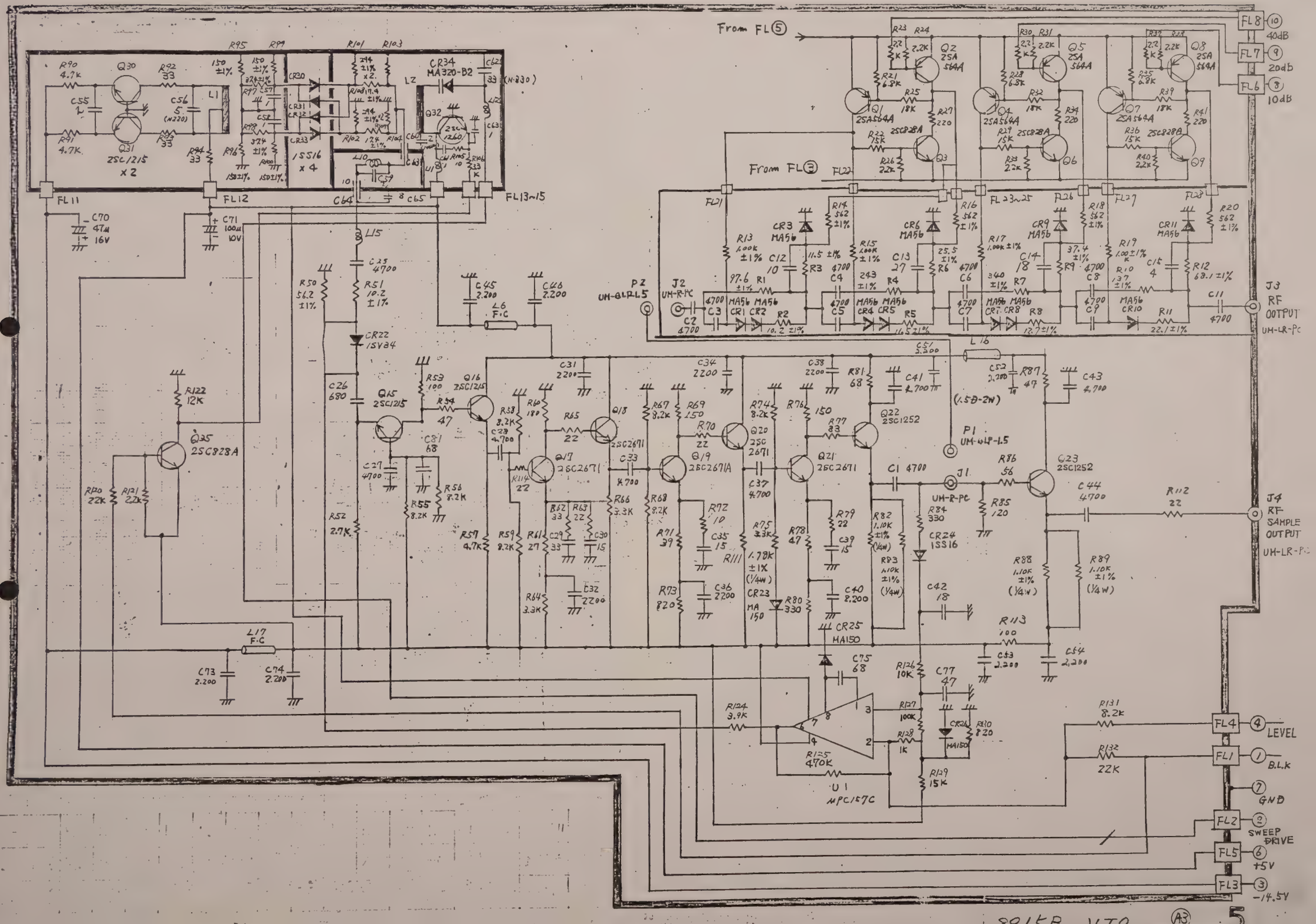
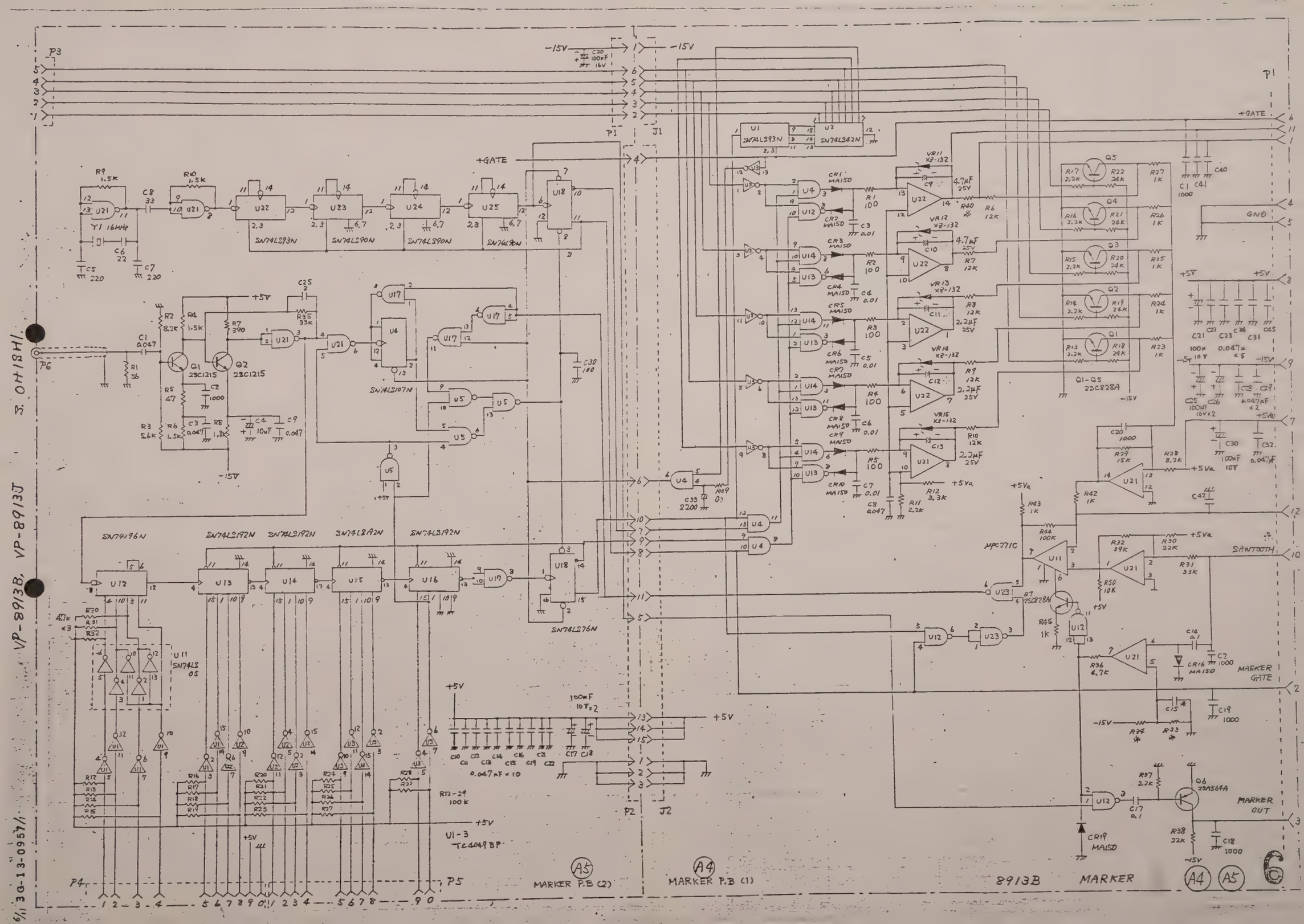
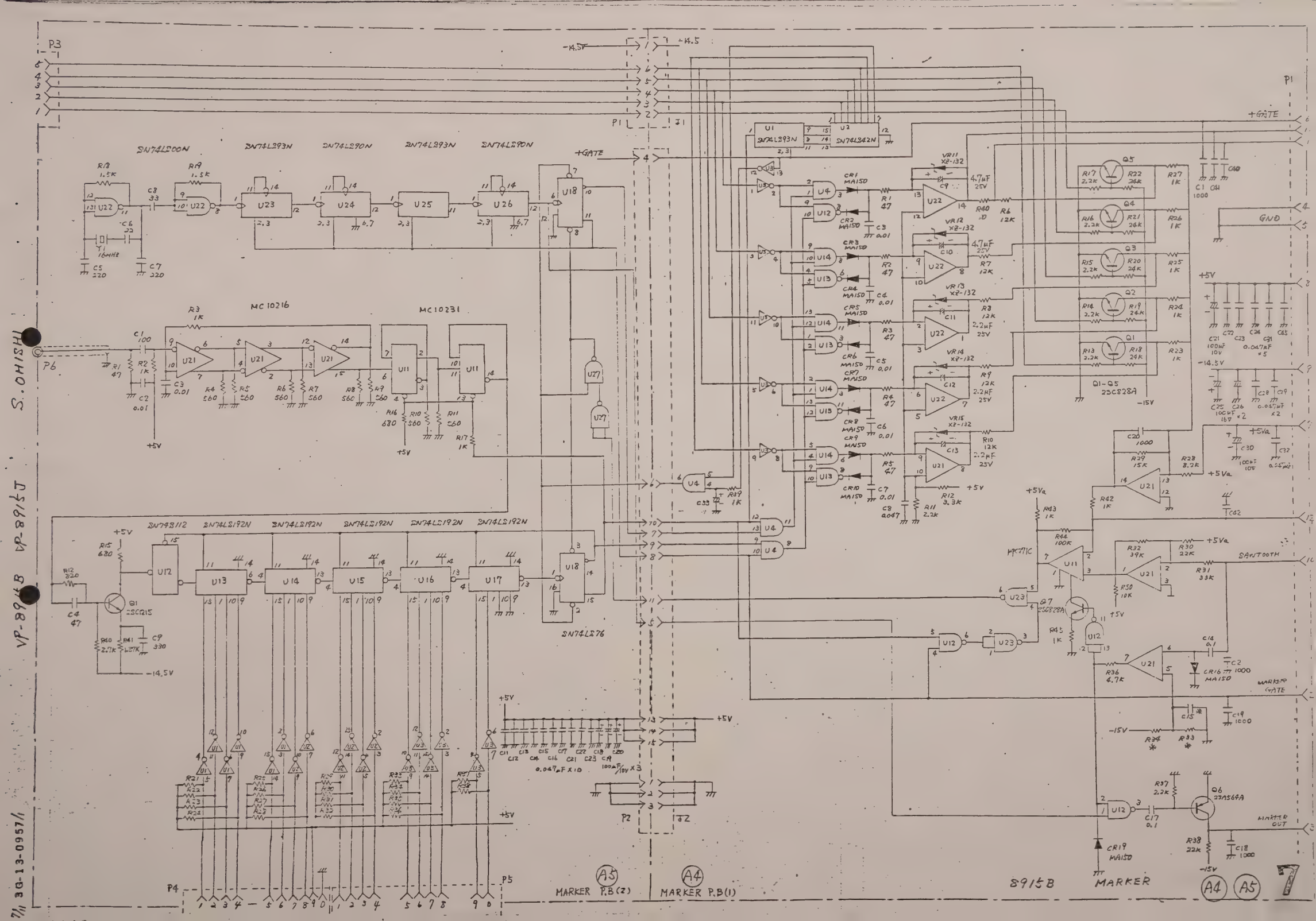
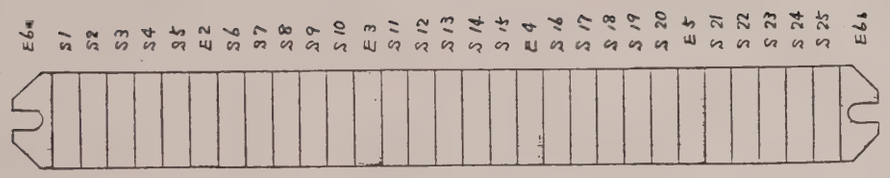
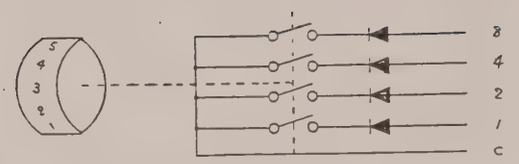


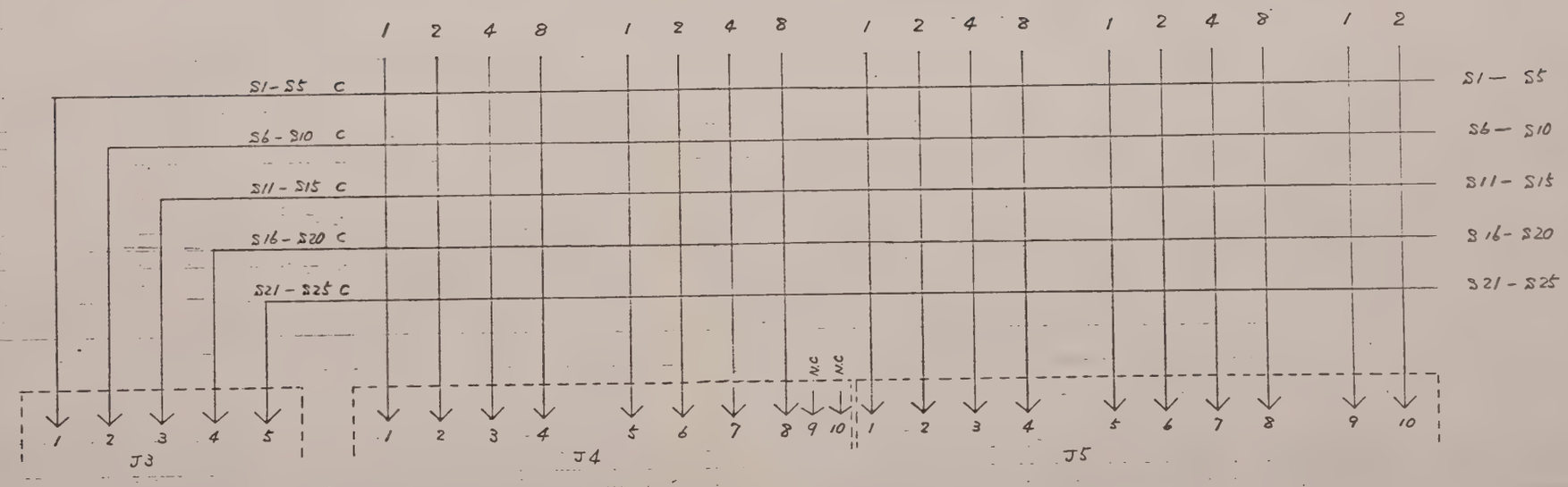
8915B VTO A3 5


P3
P1
J1
P6
P4
P5
P2
J2
+GATE
-15V
+5V
GND
SN74LS93N
SN74LS90N
SN74LS107N
SN74196N
SN74LS192N
SN74LS76N
SN74LS 05
TC4049BP
Q1 2SC1215
Q2 2SC1215
Q1-Q5 2SC828A
Q6 2SA568A
MPC277C
SAWTOOTH
MARKER GATE
MARKER OUT
CR1 MA150
CR2 MA150
CR3 MA150
CR4 MA150
CR5 MA150
CR6 MA150
CR7 MA150
CR8 MA150
CR9 MA150
CR10 MA150
CR16 MA150
CR19 MA150
Y1 16MHz
R1-29 100k
U1-3
A5 MARKER P.B (2)
A4 MARKER P.B (1)
8913B MARKER
A4
A5
6


P3
P1
P6
P4
P5
P2
J1
+14.5
-14.5
+GATE
GND
+5V
-15V
+5Va
-14.5V
SN74LS00N
SN74L293N
SN74LS90N
SN74L893N
SN74LS90N
MC10216
MC10231
SN74S112
SN74LS192N
SN74LS76
SN74LS42N
MK2711C
SAWTOOTH
MARKER
MARKER OUT
MARKER GATE
MARKER P.B(2)
MARKER P.B(1)
8915B
S.OHISHI
VP-8915B VP-8915J
03-13-0957/1







B SERIES MATRIX

A6

8

S. OHISHI

VP-8913B VP-8913B

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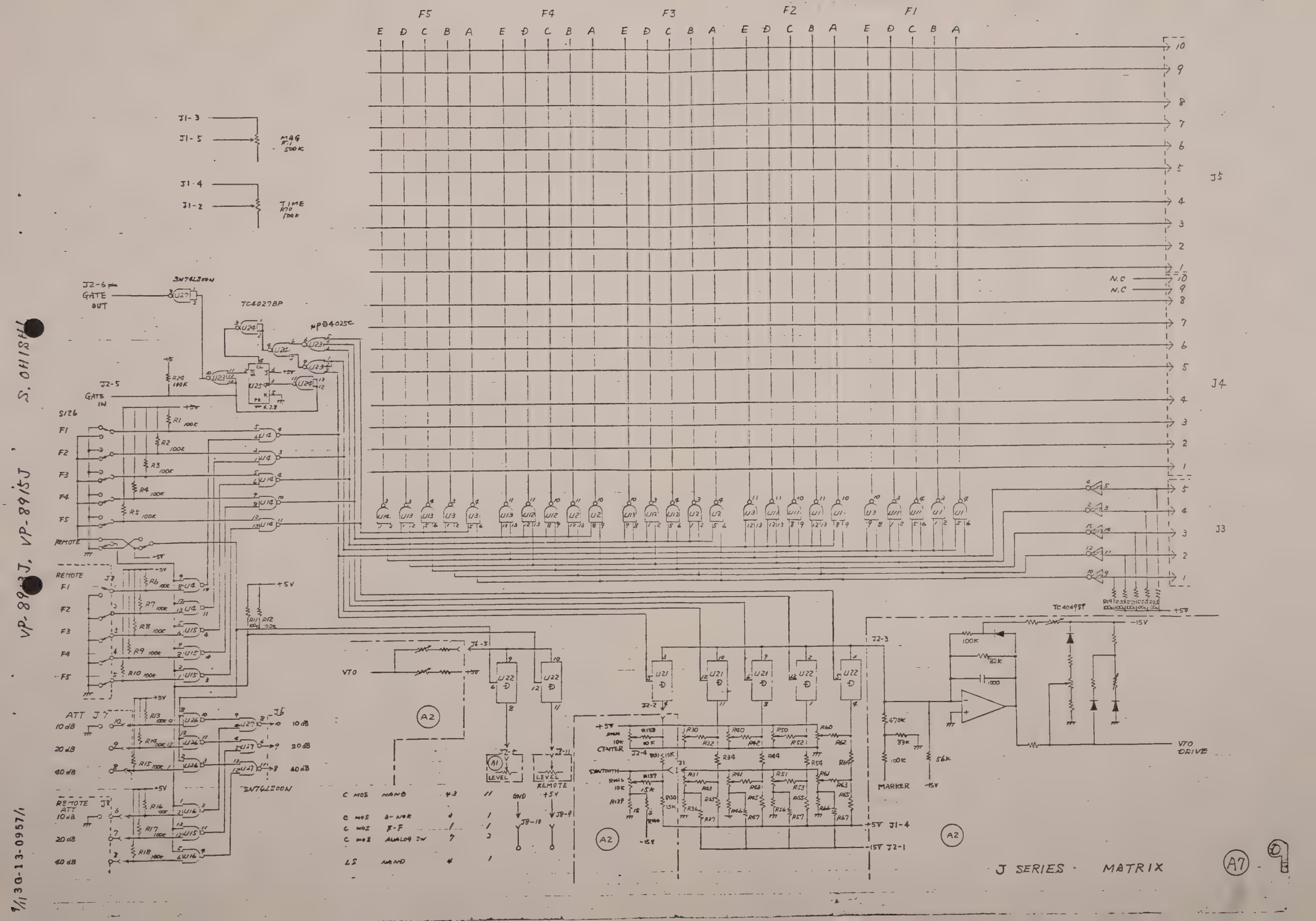
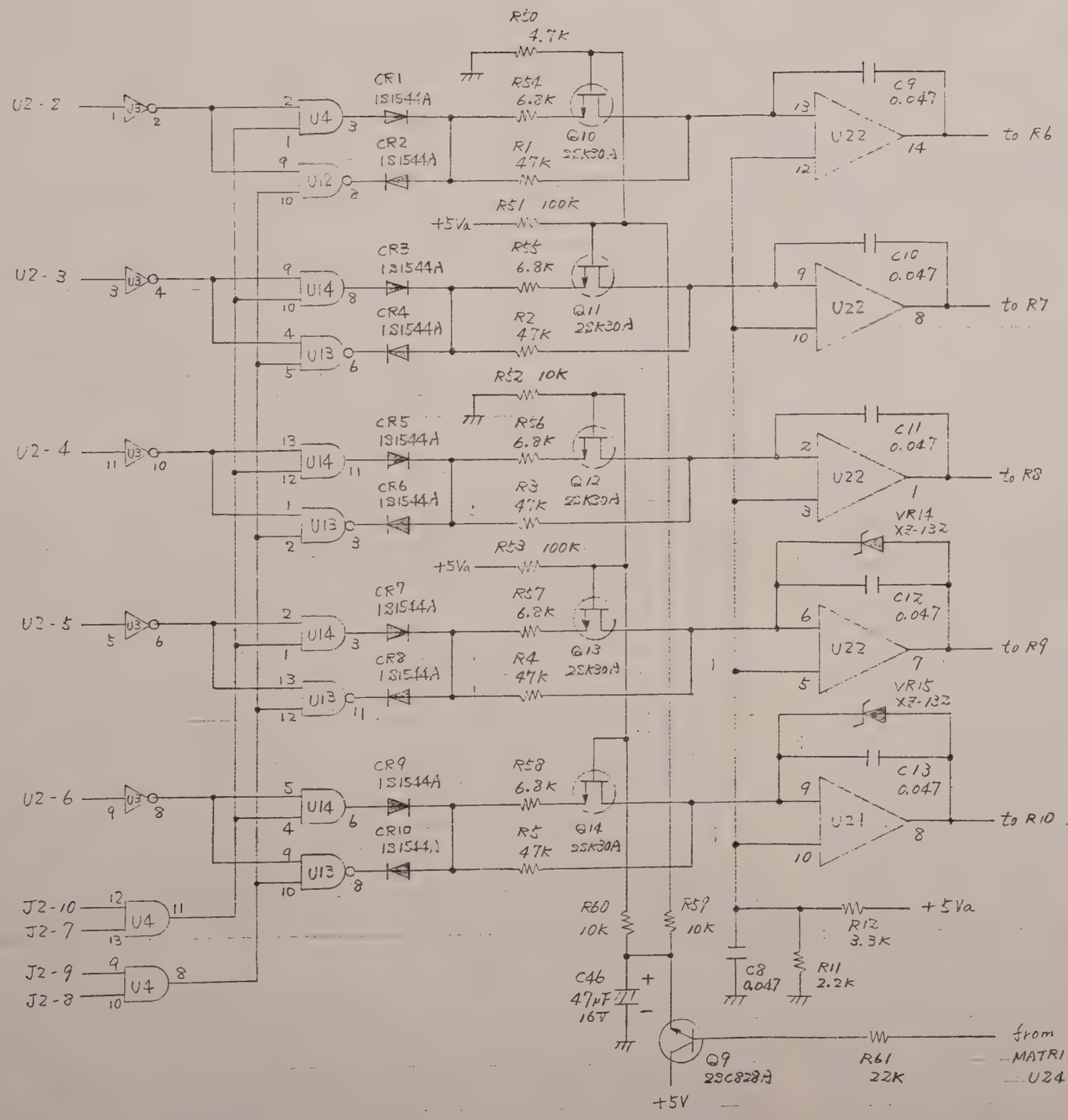
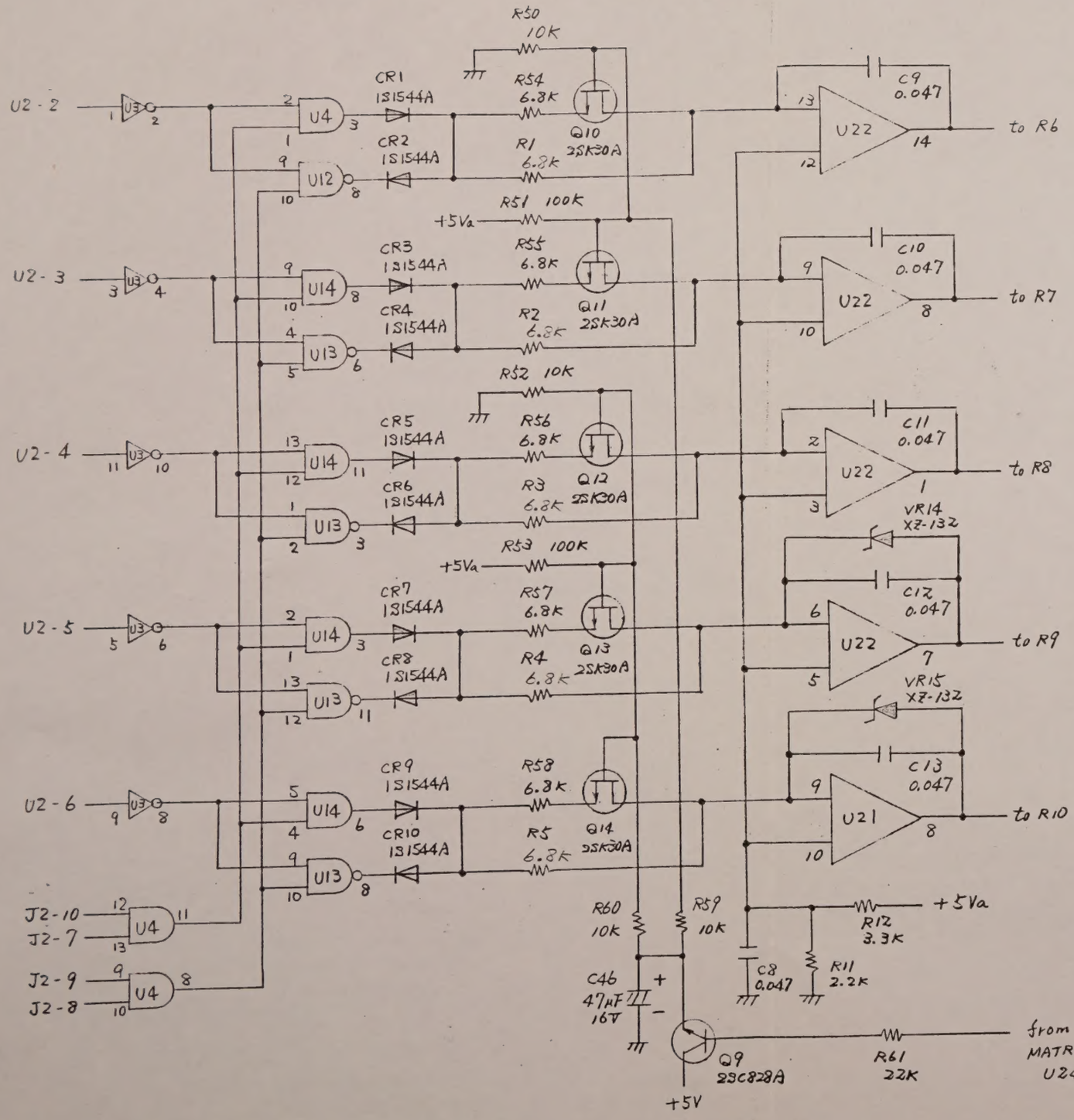

F5 F4 F3 F2 F1
E D C B A
J1-3
J1-5
MAG R71 500K
J1-4
J1-2
TIME R70 100K
J2-6 pin GATE OUT
SN74LS00N
TC4027BP
μPB4025C
J2-5 GATE IN
S126
F1 F2 F3 F4 F5
REMOTE
ATT J7
10 dB 20 dB 40 dB
REMOTE ATT J8
VTO
C MOS NAND 4-3
C MOS 2-NOR 4
C MOS F-F 1
C MOS ANALOG SW 7
LS NAND 4
LEVEL
REMOTE LEVEL
SAWTOOTH
CENTER
MARKER
VTO DRIVE
TC4049BP
J5
J4
J3
J2-3
N.C
N.C
+5V
-15V
J1-4
J2-1
J SERIES · MATRIX
A2
A7
S. OHISHI
VP-893J, VP-891SJ
9/13G-13-0957/1



U3 : SN74LS04N
U4, U14 : SN74LS08N
U12, U13 : SN74LS00N
U21, U22 : TL064CN

89 13J MARKER-(1) A4-①



U3 : SN74LS04N
U4, U14 : SN74LS08N
U12, U13 : SN74LS00N
U21, U22 : TL064CN

8915J MARKER-(1) (A4)-(1)

8915J
3G-13-0957/1